SCIENTIFIC AMERICAN

A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY, AND MANUFACTURES.

Vol. XXII.---No. 26. [NEW SERIES.] NEW YORK, JUNE 25, 1870. $3 per Annum. [IN ADVANCE.]

The Wharfdale Two-Feeder Printing Press.

Much as has been said and written upon the immense influence of the modern printing press upon modern civilization, and trite as anything further upon this topic must necessarily be, we doubt if all that lecturers, essayists, and poets have said or sung has impressed any just conception of the magnitude of this influence upon the popular mind. For ourselves, every time we contemplate the effect of printing upon the manners, morals, and intellect of the age, we fail to see any bounds to it within the limits of human thought. For the press is the chief avenue for the expression of the thought of the present time, and through it more minds are reached and placed in contact with the minds that mold popular opinion than through all other channels put together.

It follows that any improvement in the printing press at once raises the entire human race upon a higher plane than it previously occupied. What shall be said then of the value of an improvement which doubles the capacity of presses employed for printing the illustrated literature which forms so large a share of the popular reading of the period. This class of books and periodicals, it is true, includes much that is worthless and even harmful, but on the other hand almost the entire literature of science is included in it. Art has also naturalized itself here, and in a thousand forms adds to the pleasure and improves the tastes of mankind. To destroy the illustrated literature of the age would be to set the world back a century; a century of such advancement as the world has never before known.

Our engraving shows a press designed for printing illustrated books and periodicals, which is capable of performing in a superior manner twice the work of presses employed for the same work previous to its invention. That the general reader as well as professional printer may understand the nature of the improvement, we will notice briefly the general styles of presses that have been employed for this class of work. These may be divided into three classes. First, the old platen press and its improved modern forms, employing a flat bed plate upon which the forms containing the types and engravings are placed, and upon which the paper being laid by hand or by automatic devices, and the whole being brought under the platen, the latter is forced down upon it with sufficient force to make the ink from the types adhere to the paper. This class of presses does the best printing of any, where impressions of engravings are to be taken; but its work is extremely slow in comparison to that accomplished by a second class known as cylinder presses.

Cylinder presses use the flat bed plate for the forms as in the first class described, but the impressions are taken either by the passage of the bed plate under a revolving cylinder in fixed bearings, which rolls over the paper after it has been laid upon the types in the forms, or, the bed plate remaining stationary, the cylinder is rolled from end to end of the forms over the paper, the cylinder being guided by parallel ways placed upon either side of the forms, or their equivalent. The method of rolling the cylinders over the forms, is employed in proof presses, and sometimes in copper plate printing. Power presses in which this principle has been tried have not met with general approval.

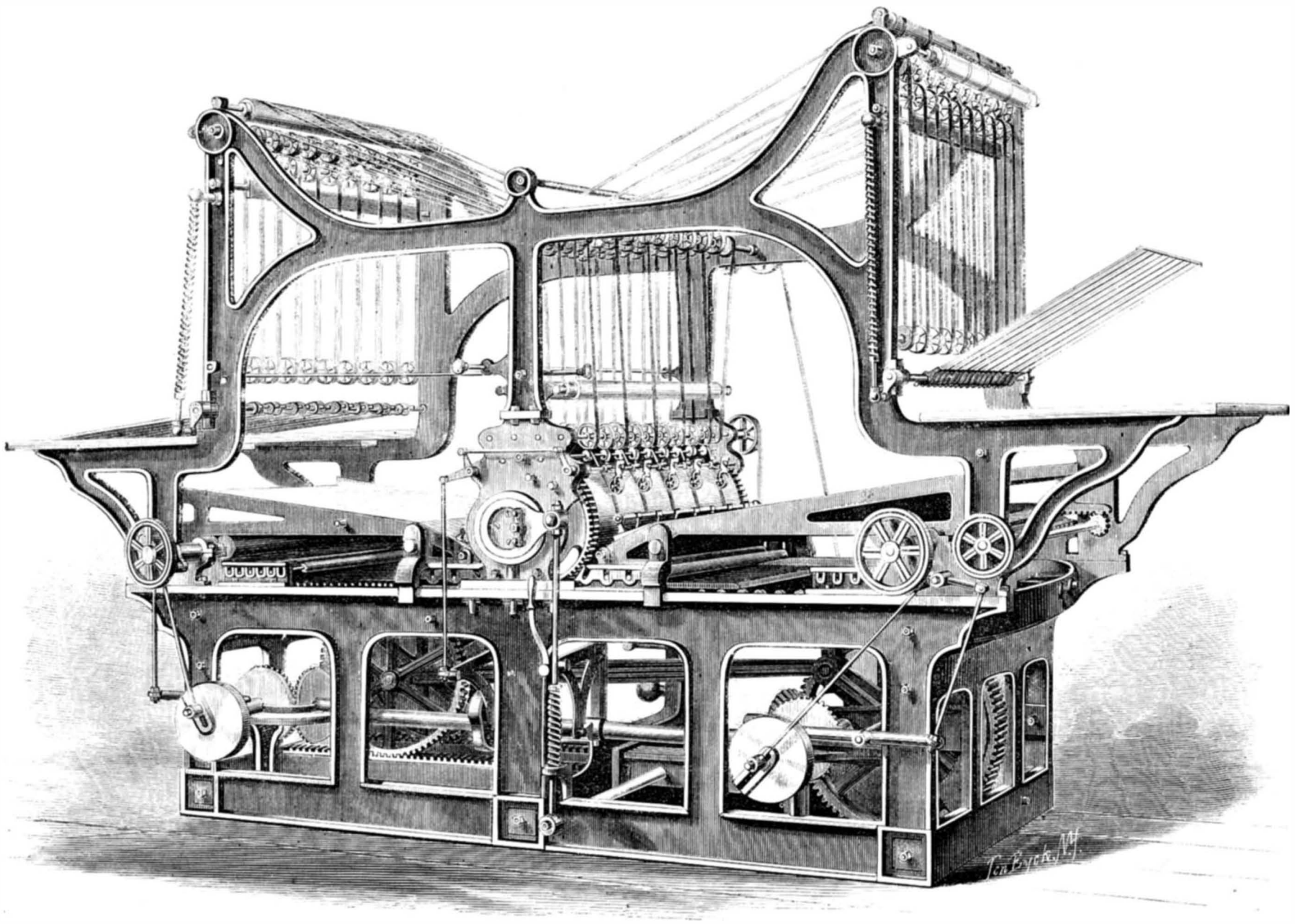
Presses of this class cannot fully compete in the quality of their work with those of the first class, but they perform with so much greater rapidity, that for all kinds of newspaper and periodical printing they have become indispensable, and for the kind of illustration usually found in this class of work they perform admirably.

A third class of presses are those known as rotary presses, in which the paper is run between cylinders, upon which the types are arranged, and other cylinders which give the impressions. These do the most rapid work of all, but are utterly unfit for printing a fine engraving.

The reason for this defect in rotary presses is, that the strength of the impression upon engravings and upon different parts of the same engraving cannot be regulated upon them. This can only be accomplished where the engraved plates or blocks are flat, and it is done by what printers style underlaying and overlaying. Underlaying consists in pasting paper upon the back of the block to raise its general level. Overlaying, on the contrary, consists in pasting paper upon the tympans of platen presses, or the cylinders of cylinder presses, in positions corresponding to the parts of the engraving of which it is desired to obtain a heavier impression. Thus if the pressman finds, say, the foreground of the impression too light, he overlays that part and thus deepens the tint, and so for other parts of the engraving, underlaying and overlaying until the required tone is produced.

Until the invention of the press which forms the subject of the present article, cylinder presses, in which the bed plates move under a cylinder turning in fixed bearings, could make only a single impression for every full reciprocation of the bed plate. The bed plate passing under the inking rollers in such presses, next passes under the impression cylinder around which the paper sheet winds, being thus brought between the impression cylinder and the inked types. While the paper, having received its impression, is unwound from the cylinder and automatically delivered upon a table, the bed plate travels back to receive a new charge of ink. In this case only a small proportion of the motion of the drum and impression cylinder is used in making the impression, and as the movement of the bed plate in one direction accomplishes no useful work while it absorbs just as much time as though an impression were taken, it follows that a construction whereby an impression could be taken during both movements of the bed plate, would double the work, while it would involve very little if any more expense of power than the old form of press.

This the Wharfdale Two-Feeder Press does. The bed-plate at each movement passes through from under the impression cylinder just far enough to come under the inking-rollers, and to receive ink clear out to the edge of the forms. The cylinder is turned, with the bed plate, first in one direction and then in the other by a rack and pinion connection between it and the bed plate, the bed plate being moved by a



THE WHARFDALE TWO-FEEDER PRINTING PRESS.

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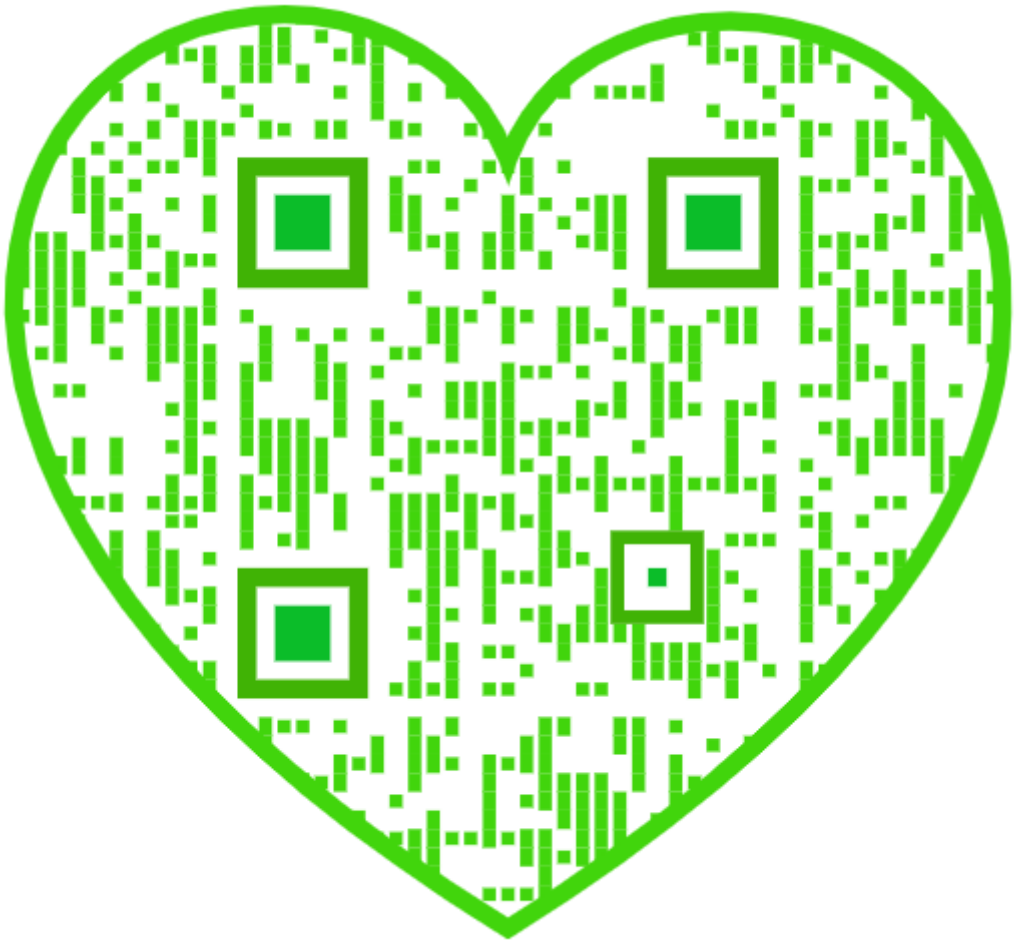

spur wheel and rack, the spur wheel being driven by a crank in such a manner that the crank pin is brought down to the dead center just at the end of each movement of the bed plate. By this means a gradual, instead of a sudden absorption of the momentum is accomplished, and a very quiet motion is produced.

The feed tables slide back on ways, so that the bed plate is easily reached for putting on or taking off, and adjusting the forms.

The apparatus for the distribution of ink to the forms does this work in a very superior manner, and does not produce that sticky condition of the ink caused by some methods used in the ordinary cylinder presses.

The press is beautifully finished, and its action is an interesting thing to witness. The paper is fed into the press from the lower tables, and each ascending upon the opposite side of the cylinder to that on which it is fed in, is delivered upon the upper table on that side, the papers following each other in so rapid a succession that they produce the effect of almost a constant stream.

It is perhaps as high a recommendation of the quality of the work performed on this press as we can give, to state that the SCIENTIFIC AMERICAN is printed upon it, and that it has impressed its own image in the engraving accompanying the present article. To the professional printer this work speaks for itself, and it would be entirely superfluous to descant upon its merits.

A two-cylinder double-feeder, with a single flat form, has recently been added to the line of Wharfdale presses, which does in a very superior manner *four times* the work possible upon the ordinary one-cylinder machine.

The press is from the celebrated manufactory of Hughes & Kimber, London, and imported by their sole agent, Mr. Victor E. Mauger, 110 Reade street, N. Y., to whom all orders should be addressed.

SCIENTIFIC EDUCATION FOR WOMEN.

Scott Russell thinks a certain amount of science is a necessary qualification for a good wife. In other words, that the art of good and economical living which mainly depends upon the exertions of the wife, no matter how liberal the provision made by the husband, can only be secured in the highest degree through the aid of technical knowledge. He asks "Ought a wife to know anything about fuel or not? Should she know that there is good and bad coal?—that what is sold to her as best coal is oftener bad coal than good?—that bad coal produces smoke and flame and not heat, and that the one wastes money and the other uses it? Ought a woman to know this knowledge, or is it beneath her?

"I must answer once for all, that I do not think any household knowledge of this sort is beneath any well-born woman. When of two things you have to choose, whether you will do the better or the worse, it seems to me you have a grave responsibility. It seems to me, if you choose the worse, or don't choose, you are to blame. It seems to me, then, that a woman should know good coal from bad, or she may waste her husband's earnings. But next, if she buys only the best coal, comes the question, Is there a right way of using the coal and a wrong?

"Ought a wife to know how to use good coal? to use it to the purpose for which it is bought? to use it for light, cheerfulness, ventilation, warmth, cookery, cleanliness, or to use it to waste, smoke, discomfort? Is any knowledge necessary for that? Cannot anybody make a good fire?—keep a good fire, prevent smoke, maintain cheerful heat, warmth without waste?

"Verily, there are few women who know this: the art to make, to maintain a good fire without excess, without waste, without smoke. Much science goes to understand a fire. 1. What is fuel made of? 2. What feeds the fire? 3. What wastes the fire? 4. What regulates the fire? 5. What makes flame? 6. What wastes heat? 7. What preserves and maintains heat? 8. What spreads it equally around a room? 9. What creates smoke, drafts, rheumatism, and colds?

"It is not the work of a moment to understand and answer all these questions. A wise housekeeper should have asked them all, and get a good answer to each; that is one element of a home, health, and comfort. Can every housekeeper solve all this?

"To feed her household well, agreeably, wholesomely, without stint, without waste, there is a technical problem of home life. What does each kind of food cost? What parts of food are the more wholesome, the more nutritious? What kinds of food do harm?—to the young, the middle-aged, the old? What quantity should be cooked, so as to give plenty without waste? What is the real value of each kind of food compared to its price? What is the price of food bought wholesale and bought at retail? What is the true weight of good kinds of food? How do I know good food from bad? How can I tell adulterated food from pure and wholesome food?

"What are the wholesome ways of cookery? What kinds of cooking render wholesome food more or less nutritious, palatable? What dishes are comely, elegant, clumsy, gross, vulgar? How can I use the least sum of my husband's earnings in housekeeping, and yet never make him feel in want of anything?

"Shall I be told that all these things come by intuition, by experience, by practice? That they are for the servants to study, not for the mistress? That in every household they are already perfectly well done? If I am assured that this is already known and done, I have only to admit that no technical education in housekeeping is required by women.

"Should the mother of a family know anything about her own clothes—her husband's—her family's? What sort, quality, price of stuff, they should be made of? What stuffs wear well? what wash well? what wash out? Which parts wear out first? How to make these parts last the longest? What sewing holds? How many yards of stuff go to each piece of dress?—how much for lining, how much for trimming, how much for shaping how much for sewing?

"Should the head of a household know how to make anything with her own hands—out of her own head? to cut out, to shape and fashion, to use a sewing machine, to sew, embroider, mend?

"All about clothes I think woman's work and woman's duty: price, stuff, shaping, sewing, durability, washing, ironing, and mending. A woman who cannot do all these things, and teach them to servants and daughters by example and precept, has not, to my mind, got a good technical education.

"There is no such physician as a wise wife or mother. Not to cure disease—that is a doctor's work—but to prevent disease, or to stop it at starting. What are our gravest illnesses?—neglected colds, indigestion, headaches. Who first finds out that we are ill? Who knows what has caused our illness? Who first takes alarm? Why should not every wife know the early symptoms of disease, the cause, the cure? There—not by the sick bed or in the hospital, but there, by the family fireside, the kindly mother should wisely watch the first symptoms of disease, wisely give the early warning, wisely apply the simple cure. Which is better in the house, a wise wife, or a perpetual physician? There is no technical training so valuable to a woman as that which shall enable her both to keep the doctor out of the house, and to send for him the moment he is wanted."

Curculio Extermination Possible.

Mr. J. E. Chamberlain, Secretary of the St. Joseph (Mich.) Fruit Growers' Association and editor of the St. Joseph *Herald*, has issued an extra containing the following statements which we deem so important to the fruit growing interests of the country that we probably cannot occupy space more profitably to our readers than by reprinting it.

The importance of this subject; the demand for prompt and persistent action; the absolute necessity of arousing every peach, plum, and stone-fruit grower to destroy the curculio, has led the editor of the *Herald*, as Secretary of the St. Joseph Fruit Growers' Association, to issue this extra. Not a single day should be lost, for, with united action, 500,000 curculio may be killed in a single day.

There is no doubt on this point. This morning, Hon. John Whittlesey called at the *Herald* office and stated that on the 14th inst., he killed 2,715 curculio about the roots of 200 trees, and on the 15th, in four hours on the same trees he killed 1,566 by actual count.

Mr. Whittlesey also stated that Mr. Ransom, Mr. Bonelle, and himself had in five hours killed upwards of 5,000 curculio in a proportion of three small orchards. That he had himself alone in two days of eight hours each killed one half more curculio than were ever taken by three men with the old-fashioned sheet in a week. Mr. Whittlesey is one of the most successful and scientific fruit growers of St. Joseph, whose word is a bond; but he said, "Do not believe me; go to Mr. Ransom's orchard and see for yourself."

Entering Mr. Ransom's orchard the editor met Dr. Lyman Collins coming out. Dr. Collins is widely known for his successful peach culture.

"Well, Doctor, is it a success?"

"Most assuredly. I tried the experiment on eight of my trees in the evening and the next morning took 104 curculio. I am going home to bug my whole orchard in this manner."

Wm. B. Ransom, the discoverer of the new method of exterminating the curculio, was found on his knees in the back of his orchard examining his curculio traps. This was at 10 o'clock A.M., and he had already killed 1,357 on 300 trees. The editor stooped down and lifted a corn not six inches long and found and killed 7 curculio. There is no doubt whatever that the long-desired means of exterminating the curculio is discovered.

HERE IT IS.

Put the orchard in the best order; level down the soil about root of every peach tree, and smooth a circle for a diameter of two and a half feet from the tree as a center. Have the ground very clean around the base of the tree. Do not leave a single hole next the tree. Leave no place where the curculio can hide except under the shelter you provide. Now lay close to the tree, and close to the ground, about four pieces to a tree, either chip, or bark, or board, or lath, or rag, or corncob, or old leather, or anything for a covert.

The curculio will conceal itself under this shelter and may be destroyed by the thousand. Go around every day and turn over each chip, kill every curculio. They will generally adhere to the chip, but may often be found on the ground under the chip.

Probably no person in the United States has studied the curculio and its habits more carefully than William B. Ransom. Some fifteen years he has been trying newspaper experiments unsuccessfully. Last year, when bugging, he discovered that all the curculio dropped within two or three feet of the roots of the peach tree, and on examination found the little Turk sheltered on the trunk and in holes near the base and the under side of the principal limbs.

For the last fortnight, Mr. Ransom has spent almost all the hours of the day lying on the ground in his orchard patiently watching and waiting for the first curculio to show himself. On the 4th of May a few single curculio were discovered, but not a single pair; on the 5th a few pair were found coupling. Constant, careful observation has led Mr. Ransom to these conclusions.

In the fall the curculio seeks a warm and safe shelter to hibernate. This is either the ground, or leaves, stumps, logs, old fences, woods, and other congenial places of concealment. The first warm day in spring that starts vegetable life calls the curculio forth, and it proceeds to its feeding and breeding ground. They walk very fast, and they fly and feed generally at night, eating the young and tender leaves. The first warm days this year they fed, then the weather fell cold, and for a week Mr. Ransom found no indication of their feeding. Since Friday night, the 13th, the weather warm, the curculios have been feeding. They scatter all over the tree to feed, and come down towards morning and as late as 7 A.M. to hide.

They crawl on cold days and nights, and hide under the shelter of the trunk of the tree, waiting to feed when the nights become sufficiently warm. The curculio uses the green peach only to hold its egg. It sometimes eats the ripe peach, also blackberries, quinces, and other fruits.

Some idea of the quantity to be taken from a single tree may be found from the following: Mr. Ransom states that on the 14th he took 25; on the 15th in the morning 50; in the evening about sundown 15; and on the 16th, 60 were killed from the same tree, and of these 41 were taken in a cluster under a chip two by three inches.

The editor of the *Herald* visited Mr. Ransom at 1½ P.M., and found he had in about four hours killed 2,109 by actual count, and went himself into the orchard and found curculio lying asleep under the traps in the intense heat of a boiling sun.

Improvement in Enameling Iron and Steel.

The process of Benjamin Baugh, of Chadwick, England, of enameling iron and steel, patented recently in the United States, is as follows:

Lay upon the surface of the plate of the metal to be enameled a uniform ground, of any color required to produce the intended design, as, for instance, a name-plate, or tablet, with the ground white and the inscription in blue. The white ground, having been fused on in the melting-furnace and allowed to cool, there is then applied with a brush evenly over the whole surface a coating of blue enamel, the materials of which are finely levigated and mixed with gum-arabic and water, or other mucilage, to form a paste of slightly adherent properties.

When dry, a stencil of the inscription, or of each letter separately, is laid on, and the enamel paste is removed from the parts which are unprotected by the stencil, by the application of a stiff brush, leaving the ground clean, except the letters. The plate is then again subjected to heat, whereby the paste, which is fusible at a lower temperature than the ground previously laid, becomes permanently fixed upon it.

The mechanical removal, by means of a brush, enables very delicate lines to be formed through the paste, to expose the enamel ground, and admits of the use of ornaments having sharp angles and minute points and details to be distinctly and perfectly rendered.

The ground may be dark, and of any color, as well as of the kind described, and the subsequent coat of a lighter color; as, for instance, the ground may be of blue and the inscription white and a succession of colors may be given, to produce a variously-colored design, by the same method.

The inscription or design may be cut out in the stencil, and the ground thereby exposed be removed by the brush, instead of the surrounding parts, with a like effect, it being left to the choice of the designer whether this process be followed, or that previously described.

The stencils are formed of very thin sheet-metal (or even of paper, where they require to be used but a few times), which, by their flexibility, lie more closely in contact with the surface, and leave the lines and margins of the figures perfect, while they conform to convex and irregular surfaces.

He combines with the method described, the use of artistic graphic representations, such as views, portraits, or groups, thereby producing metal tablets decorated in enamel, in a manner adapted to architectural purposes, as the finishing of interiors, panels for cabinet-work, etc. Such designs are produced upon stone in the usual lithographic manner, and printed in successive impressions upon paper prepared for transferring, by having its surface coated with gum-arabic, or other substance that is soluble in water, mineral colors and fluxes being used, which are adapted to fuse under heat, and combine to form the picture in enamel, of appropriate colors.

The enamel ground having been fused on, as previously described, for stenciling, it is covered with copal or other suitable varnish, and the face of the prepared picture is laid upon it and pressed, to insure adhesion of all parts, when the paper is removed by wetting, as is ordinarily done in transferring prints. The plate is then subjected to heat until the colors of the picture are fused, and become incorporated with the previously enameled surface.

Care of Brushes.

Brushes used for applying finishing varnishes should be cared for with the utmost pains, as good work depends much upon the good condition of the brushes. The *Coach-Makers' Monthly* suggests that a good way to keep them is to suspend them by the handles in a covered can, keeping the points at least half an inch from the bottom, and apart from each other. The can should be filled with slow drying varnish up to a line about a sixteenth of an inch above the bristles or hair. The can should then be kept in a close cupboard, or in a box fitted for the purpose.

As wiping a brush on a sharp edge of tin will gradually split the bristles, cause them to curl backward and eventually ruin the brush, the top of the can should have a wire soldered along the edge of the tin turned over, in order to prevent injury. Finishing brushes should not be cleansed in turpentine, except in extreme cases. When taken from the can, prepare them for use by working them out in varnish, and before replacing them cleanse the handles and binding with turpentine.

The Season of Fairs.

The season of fairs and exhibitions is at hand. The more enterprising associations under whose auspices these exhibitions are held, are beginning to issue prospectuses, and it appears that the coming summer and autumn will be more fruitful than usual in agricultural and mechanical displays of this kind. If the managers of such associations will please forward information concerning any contemplated display to be held by them, we shall be happy to give it brief mention in our columns.

IT is said that the Mexican Government has ordered Mr Williams, an engineer, to survey the Isthmus of Tehuantepec for a ship canal.

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HABITS OF THE STRIPED SQUIRREL---A WHITE WOODCHUCK.

Mr. Ira Sayles, of Rushford, N. Y., writes to the *American Naturalist* as follows:

"I lately noticed in my garden a bright-eyed chipmunk, *Sciurus striatus*, advancing along a line directly towards me. He came briskly forward, without deviating a hair's breadth to the right or the left, till within two feet of me; then turned square towards my left—his right—and went about three feet or less. Here he paused a moment and gave a sharp look all around him, as if to detect any lurking spy on his movements. (His distended cheeks revealed his business; he had been out foraging). He now put his nose to the ground, and, aiding this member with both forepaws, thrust his head and shoulders down through the soft muck, half burying himself in an instant.

"At first, I thought him after the bulb of an *erythronium*, that grew directly in front of his face and about three inches from it. I was the more confirmed in this supposition, by the shaking of the plant.

"Presently, however, he became comparatively quiet. In this state he remained, possibly, half a minute. He then commenced a vigorous action, as if digging deeper; but I noticed that he did not get deeper; on the contrary, he was gradually backing out. I was surprised that, in all his apparent hard work (he worked like a man on a wager) he threw back no dirt. But this vigorous labor could not last long. He was very soon completely above ground; and then became manifest the object of his earnest work; he was refilling the hole he had made, and repacking the dirt and leaves he had disturbed. Nor was he content with simply refilling and repacking the hole. With his two little hand-like feet he patted the surface, and so exactly *replaced the leaves* that, when he had completed his task, my eye could not detect the slightest difference between the surface he had so cunningly manipulated, and that surrounding it. Having completed his task, he raised himself into a sitting posture, looked with a very satisfied air, and then silently dodged off into a bush-heap, some ten feet distant. Here, he ventured to stop, and set up a triumphant "chip! chip! chip!"

"It was now my turn to dig, in order to discover the little miser's treasures. I gently removed enough of the leaves and fine muck to expose his hoard—half a pint of buttercup seeds, *Ranunculus acris*. I took out a dozen seeds or so, recovered the treasure as well as my bungling hands could, and withdrew filled with astonishment at the exhibition of the cunning, skill, and instinct of this little abused denizen of our field-borders.

"In my boyhood days I had killed many of the little fellows; had unearthed the treasures in their burrows many times; had seen them, as I supposed, under every variety of aspect; in short, I thought I knew the chipmunk, every inch; but here was a new revelation of chipmunk character, for which I was totally unprepared.

"It grieves me that I find it utterly impossible with words to convey adequately to you and your readers anything like a complete picture of the motions, the skill, the carefulness, the completeness of effect, and the consequent satisfaction exhibited by this little harvester. I have never read or heard of any other man's having witnessed a similar scene, nor do I expect myself ever again to witness one. My opportunity for observation was as perfect as it could possibly be; for he was so near me that I could almost stoop over and lay my hand on him, while he was half buried under the leaves.

"The lesson is perfect; for what our chipmunk does, all chipmunks do, under the same circumstances. Where does instinct stop, and reason begin? Wherein does instinctive, *irrational* skill differ from rational skill?"

Mr. S. Tenney, of Williams College, writes to the same journal:

"It may interest you and some of your readers to know that I have obtained a perfectly white woodchuck, a perfect albino of *Arctomys monax* of Gmelin. There is not a dark hair on his body or tail, and his eyes are of a clear, rich, carnelian color. He was caught on Northwest hill, Williamstown, Mass., and brought to me alive. From the first he fed freely on clover, especially the clover heads, and made a nice nest for himself from the part discarded as food; in this nest he spent most of his time, taking nearly the form of a ball. He always exhibited a readiness to bite, and it was not safe to touch him with the hand. One day I carried him, in his small cage, to my lecture room, and afterwards put him in my private room and left him alone. When I returned I found him out of the box or cage, and bottles and trays of natural history specimens scattered upon the floor. After disturbing things generally he had taken up his position behind a large box of fossils. From his retreat he looked as unconcerned as if nothing had happened. Without much trouble I secured him in his box again, and carried him home and put him in a large cage in my cellar, which is well lighted and ventilated. About midway between the top and bottom of this cage is a shelf which touches the bars or slats in front, and extends backwards about half the depth of the cage. This shelf was put in so that the woodchuck might have something to rest upon besides the floor of the cage. After the cage was done it was desired to turn it so that what is naturally the back should be the bottom, the slats or bars thus being on the top instead of at the side; this brought the shelf into a vertical instead of a horizontal position. Now observe what this woodchuck did: he gnawed through the edge of this shelf, which was against the bars, in order to get into the other part of his cage, although there was a space of eight or ten inches below the lower edge of the vertical shelf for the whole width of the cage, and when he was disturbed he often run through this hole instead of going along on the bottom.

"I was interested to see that he used everything he could get to enlarge and perfect his nest, not only all of his discarded clover stalks, and the rags which I gave him, but also all the chips which he gnawed from his cage. But he did not get thoroughly tamed, and so availing himself of the absence of a board, which had covered a hole which he had been gnawing, he squeezed out through the hole, scaled the cellar wall, and escaped through an open cellar window. A few weeks afterwards he was killed by a farmer's dog, and I have sent his skin to Mr. Jillson to be mounted.

"Mr. Hitchcock, of this town, informs me that he has seen a living white woodchuck in New Lebanon, N. Y."

ANCIENT AND MODERN COINAGE.

Platinum was coined in Russia from 1828 to 1845. But the metals best adapted and most generally used as coin, are copper, nickel, silver, and gold; the first two being now used for coins of small value, to make change, the two latter, commonly designated "the precious metals," as measures of value and legal tender. On the continent of Europe a composition of silver and copper, called bullion, has long been used for small coins; which are made current at a much higher value than that of the metals they contain. In China Sysee, silver is the principal currency, which is merely ingot silver of a uniform fineness, paid and received by weight.

Spanish and Mexican dollars also circulate there, but only after they had been assayed and stamped as proof that they are of the standard fineness. As Asia Minor produced gold, its earliest coinage was of that metal. Italy and Sicily possessing copper, bronze was first coined there.

The Lydians had gold coins at the close of the ninth century B. C.; Greece proper only at the close of the eighth century B. C. Servius Tullius, King of Rome, made the pound weight of copper current money.

The Romans first coined silver 281 B. C., and gold 207 B. C. Some nations, although they worked the metals with skill, seem never to have coined money, and such was the case with the Irish, of whom no coins are known prior to the English invasion in the twelfth century.

The amount of specie existing in Europe, A. D. 14, was equal in value to but £358.

After the Augustan era the product of the European mines failed, and the stock of coin gradually disappeared until the ninth century, each step of its fall being marked by the greater poverty and social degradation of the people, until at last such was the scarcity of coin, *human beings* in Britain were made a legal tender at specified rates.

INVENTION OF BANK NOTES.

This dearth of the precious metals contributed largely toward establishing the dark ages. Out of these depths arose the great modern institutions—the mercantile theory and credit—the one a palliative and the other a cure. No increase in the stock of coin occurred until after the discovery of America, but the invention of paper credit largely alleviated the prevailing misery. This invention is due to the Jews, who, in 1160, introduced bills of exchange, and who were the only persons, from the institution of the canon law against the taking of interest for the loans of money to the sixteenth century, who, in Western Europe, durst make a business of giving credit.

The same people established the first banks in Europe. That of Venice was established in 1157, that of Geneva in 1345, that of Barcelona in 1401, and that of Genoa in 1407. The discovery of America in 1492, produced no immediate increase in the European stock of coin. The mines of Potosi were opened in 1545, but it was not until near the seventeenth century that the stock of coin sensibly increased. The taking of interest was totally forbidden in England until 1571, and the device of extending credit by means of indorsement was not practiced until a century later, when it was introduced from Holland.

INCREASE OF COIN.

The stock of coin steadily increased until 1827, when it reached its highest point, and then declined until the opening of the Pacific coast mines in 1848, when it again increased, passing in 1860 its greatest previous hight, and obtaining in 1867 the enormous sum of two thousand six hundred millions of dollars.

Copper coins, few in number, were used by the Mint of the United States as early as 1792; but these are now so rare that one of them sold at auction in Philadelphia, in January, 1860, for sixty-five dollars and fifty cents, and another for fifty dollars. The Mint did not get fairly into operation until 1793, when the first copper cent appeared.

The estimated amount of gold in existence at the commencement of the Christian era was $427,000,000. At the discovery of America, in 1492, this amount had diminished to $57,000,000. In 1600 the amount had risen to $105,000,000; in 1700 to $351,000,000; in 1800 to $1,251,000,000. The Russian mines extending over one third of the surface of the globe, on parallel fifty degrees north latitude, were discovered in 1819.

In 1843, the estimated amount of gold in existence was $2,000,000,000.

Next followed the discoveries in California, February 9th, 1848, and in Australia, February 12th, 1851, which added enormously to the gold production. In 1853, the amount in existence was computed at $3,000,000,000; and in 1860 it was $4,000,000,000.

From the commencement of the Christian era to the discovery of America, it was estimated that gold had been taken from the surface, and mined to the amount of $3,800,000,000. From that date to the close of 1842, $2,800,000,000; to 1860, Russia adds $746,000,000 and California and Australia, $2,000,000,000 more. The amount of gold at present in existence is estimated at $5,950,000,000. The quantity of gold and silver, of all denominations, in all quarters of the globe, is set down, by the best authorities, at from three to four hundred millions pounds sterling; and the quantity of plate and ornaments at about $400,000,000.

WHAT BECOMES OF THE COIN.

In the reign of Darius gold was thirteen times more valuable, weight for weight, than silver. In the time of Plato it was twelve times as valuable. In that of Julius Cæsar gold was only nine times more valuable, owing, perhaps to the enormous quantities of gold seized by him in his wars. It is a natural question to ask, what became of the gold and silver? A paper read before the Polytechnic Association by Dr. Stephens, recently, is calculated to meet this inquiry He says, of our annual gold product, full fifteen per cent is melted down for manufacture; thirty-five per cent goes to Europe; twenty-five per cent to Cuba; fifteen per cent to Brazil; five per cent direct to Japan, China, and the Indies; leaving but five per cent for circulation in this country. Of that which goes to Cuba, the West Indies, Brazil, full fifty per cent finds its way to Europe, where, after deducting a large percentage used in manufacturing, four fifths of the remainder is exported to India. Here the transit of the precious metal is at an end. Here the supply, however vast, is absorbed, and never returns to the civilized world.

The Orientals consume but little, while their productions have ever been in demand among the Western nations. As mere recipients, therefore, these nations have acquired the desire of accumulation and hoarding, a passion common alike to all classes among the Egyptians, Indians, Chinese, and Persians. A French economist states that in his opinion the former nation alone hide away $20,000,000 of gold and silver annually, and the present Emperor of Morocco is reported as so addicted to this avaricious mania that he has filled seventeen large chambers with the precious metals. The passion of princes, it is not surprising that the same spirit is shared by their subjects, and it is in this predilection that we discover the solution of the problem as to the ultimate disposition of the precious metals. This absorption by the Eastern nations has been uninterruptedly going on since the most remote historical period. According to Pliny, as much as $100,000,000, in gold, was, in his days, annually exported to the East. The balance of trade in favor of those nations is now given as $80,000,000.

A system of international coinage is proposed, and a congress has recently been held in Paris, at which the several nationalities were represented, including the United States.

If our Government shall indorse the proposed system, there will be a national change in our coinage, if we shall ever return to hard money times. The proposed standard of coinage—the *franc*—is equal in value to about nineteen and one fifth cents. A five franc piece is accordingly worth four cents less than the American dollar, which is our present standard of coinage. Under the proposed plan, our present half-dollar would be represented by a piece worth forty-eight cents, etc.

The ancient English penny was the first silver coin struck in England. It was equal in weight to the present three-penny piece.—*Christian Union.*

Faraday in Private Life.

About 1823, when my uncle Faraday was studying elocution under Smart, he took great trouble to teach me, a little girl of seven, to read with good emphasis, and I well remember how unweariedly he would go over and over one sentence, and make me repeat it with the upward and downward inflections, till he was satisfied; and then perhaps would follow a good romp, which pleased the little girl much better than elocution.

My uncle read aloud delightfully. Sometimes he gave us one of Shakespeare's plays or Scott's novels. But of all things I used to like to hear him read "Childe Harold;" and never shall I forget the way in which he read the description of the storm on Lake Leman. He took great pleasure in Byron, and Coleridge's "Hymn to Mont Blanc" delighted him. When anything touched his feelings as he read—and it happened not unfrequently—he would show it not only in his voice, but by tears in his eyes also.

Nothing vexed him more than any kind of subterfuge or prevarication, or glossing over things. Once I told him of a professor, previously of high repute, who had been found abstracting some manuscript from a library. He instantly said—"What do you mean by abstracting? You should say stealing; use the right word, my dear."

If he gave me my choice in anything, he could not bear indecision, and I had not only to decide, but to decide quickly. He thought that in trifles quickness of decision was important, and a bad decision was better than none. When my uncle left his study and came into the sitting-room, he would enter into all the nonsense that was going on as heartily as any one, and, as we sat round the fire, he would often play some childish game, at which he was usually the best performer; or he would take a part in a charade, and I well recollect his being dressed up to act the villain, and very fierce he looked. Another time I recollect him as the learned pig. In times of grief or distress his sympathy was always quick, and no scientific occupation ever prevented him from sharing personally in all our sorrows, and comforting us in every way in his power. Time, thoughts, purse—everythin s was freely given to those who had need of them.—*Mis Reid's Recollections.*

THE first steamboat used in Great Britain was the *Comet*, a small vessel of forty feet keel, and ten feet and a half beam with an engine of three-horse power, which carried passengers on the river Clyde, Scotland, in 1814.

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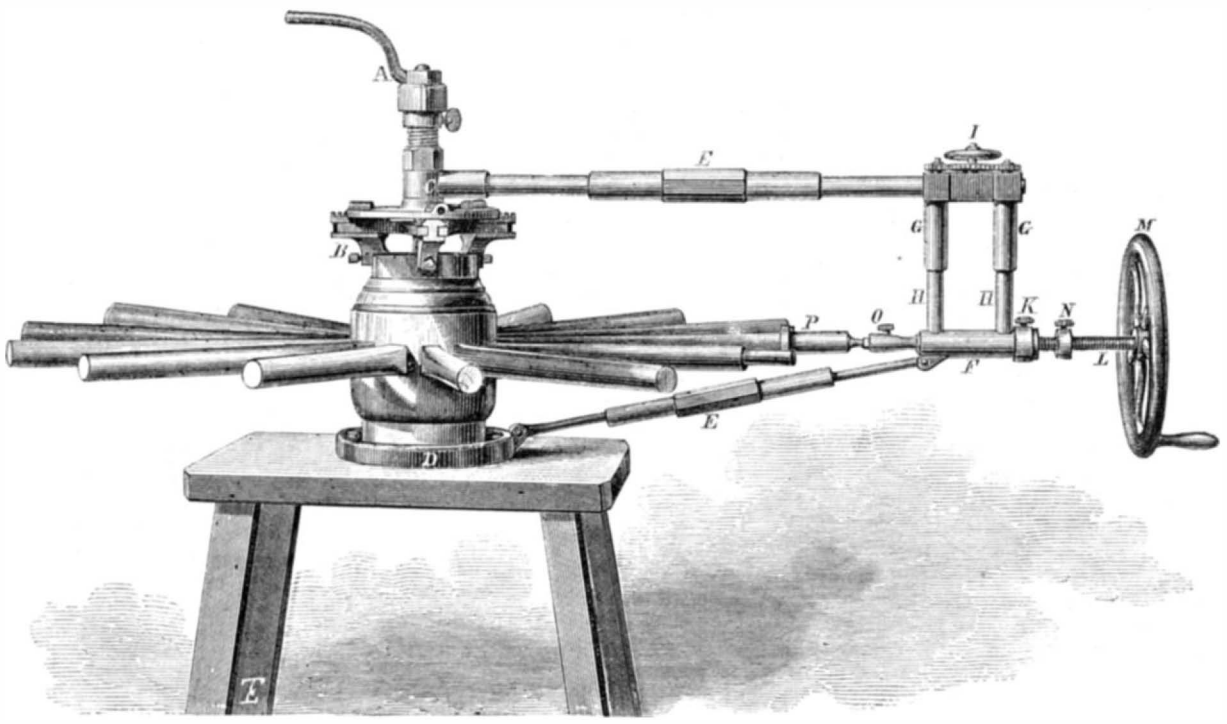
Improved Spoke Tenoning Machine.

Our engraving is a good delineation of an excellent device for tenoning the ends of spokes, intended to facilitate this operation, and to enable it to be more accurately performed. This device is simple in its parts, is portable and easily applied, comprises nothing liable to get out of order, and will, it is claimed, enable the workman to do more and better work than hitherto.

A bench is employed, similar to the old style of bench used by carriage makers while tenoning the spokes and putting on the fellies of wheels. The hub rests upon a metallic plate fixed upon the center of the bench, and a rod rises through the center of the bench plate and hub, having a screw thread cut upon it, so that the whole apparatus is secured to the bench by means of the nut and lever, A, the top of the hub being gripped by a series of adjustable clutches, B, and held by set screws, as shown, the clutches and the plate to which they are attached forming a centering chuck for the hub. This chuck has rising from it a hollow stem, around which a collar, C, is fitted. A collar, or rim, D, is also fitted around the plate upon which the hub rests.



CRUTCHFIELD AND WHITTEN'S SPOKE TENONING MACHINE.

From these collars extend jointed adjustable arms, their lengths being made variable by making each of them in three parts, the middle part, E, of each being a right and left hand nut, fitting right and left hand screws on the other portions of the arms. These arms carry at their outer ends the brace guide, which by their aid is adjusted to any required length of spoke. F is the brace guide, made adjustable vertically to suit varying lengths of hubs. This adjustment is accomplished by means of screws working in hollow tubes, G, into which the tubes, H, telescope. The screws are made to work simultaneously, and keep the brace guide square with the hub, by means of two small gears fitting a middle gear which is worked by a hand wheel, I, the two small gears being keyed to the screw. Thus both screws move together and traverse equal distances.

Into the end of the brace guide, F, is fitted a nut, which, having no thread upon its outer side, turns freely in F when not held by a set screw, K. Upon the inner surface of this nut a very fine thread is cut, into which the shaft, L, of the brace, having a corresponding thread, fits. When the set screw, K, being tightened, holds the nut from turning, the screw shaft, L, feeds backward or forward, according as the hand wheel, M, is turned to the right or the left.

A collar, N, with a set screw is adjusted upon the screw shaft, L, which gages the depth of the tenon, for when it meets the nut in the end of J, no further movement is possible until K is loosened, when the shaft, L, will turn but not advance. This secures the exact squaring of the shoulders at the bases of the tenons.

The brace, O, is made to receive and hold, first, a pointing tool, and then a hollow tenoning auger, P, by which the tenons are cut.

It will be seen that the important principle of working from a fixed center in the execution of circular work, is fully observed in this device, and that the machine being set for a single spoke, no further care is necessary, as each successive spoke will be cut precisely like the preceding one.

Patented, through the Scientific American Patent Agency, January 11, 1870, by J. P. Crutchfield and C. T. Whitten, whom address for further information, at Longmire's store, Edgefield county, S. C.

Curiosities of Eating.

An old beau, formerly well known in Washington City, was accustomed to eat but one meal in twenty-four hours; if, after this, he had to go to a party and take a second dinner, he ate nothing at all next day. He died at the age of seventy years.

A lady of culture, refinement, and unusual powers of observation and comparison, became a widow. Reduced from affluence to poverty, with a large family of small children dependent on her manual labor for daily food, she made a variety of experiments to ascertain what articles could be purchased for the least money, and would, at the same time, "go the farthest," by keeping her children longest from crying for something to eat. She soon discovered that when they ate buckwheat cakes and molasses, they were quiet for a longer time than after eating any other kind of food.

A distinguished Judge of the United States District Court observed that, when he took buckwheat cakes for breakfast, he could sit on the bench the whole day without being uncomfortably hungry; if the cakes were omitted, he felt obliged to take a lunch about noon. Buckwheat cakes are a universal favorite at the winter breakfast table, and scientific investigation and analysis have shown that they abound in the heat-forming principle, hence nature takes away our appetite for them in summer.

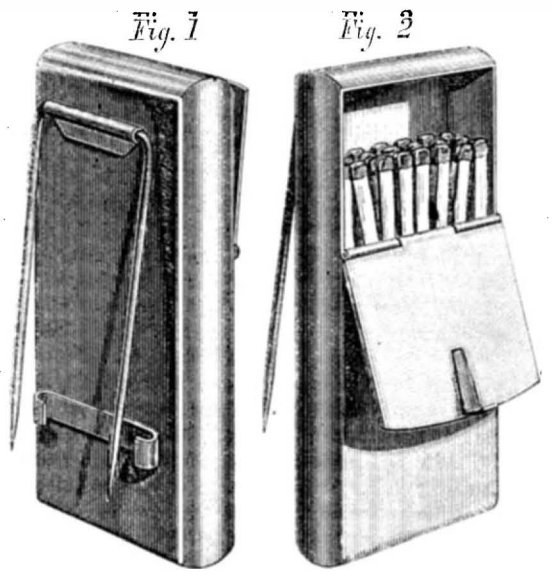
During the Irish famine, when many died of hunger, the poor were often found spending their last shilling for tea and and tobacco and spirits. It has also been often observed in New York, by those connected with charitable institutions, that when money was paid to the poor, they often laid out every cent in tea or coffee instead of procuring the more substantial food, such as meal, and flour, and potatoes. On being reproved for this apparent extravagance and improvidence, the reply, in both cases, was identical; their own observation had shown them that a penny's worth of tea, or tobacco, or liquor, would keep off the sense of hunger longer than a penny's worth of anything else. Scientific men express the idea by saying, "Tea, like alcohol, retards the metamorphosis of the tissues;" in other words, it gives fuel to the flame of life, and thus prevents it from consuming the fat and flesh of the body.

If a person gets into the habit of taking a lunch between breakfast and dinner, he will very soon find himself getting faint about the regular luncheon time; but let him be so pressed with important engagements for several days in succession as to take nothing between meals, it will not be long before he can dispense with his lunch altogether. These things seem to show that, to a certain extent, eating often is a mere matter of habit. Whole tribes of Indian hunters and trappers have been known to eat but once in twenty-four hours, and that at night.—*Dr. Hall's Tracts.*

IMPROVED MATCH SAFE.

Our engraving illustrates a new patent match safe, intended to be easily attached to the garments of the carrier by a pin clasp.

The invention consists in hinged pins and catches for the same, formed upon the side of the safe to which the pins are attached, as shown in the engraving. A match safe is thus



produced, which will be a great convenience to smokers, and others who in driving, hunting, fishing, etc, desire to reach matches without disturbing their outer garments For lamplighters in cities during inclement weather it will also prove serviceable.

Patented, through the Scientific American Patent Agency, July 6, 1869. The entire right will be sold. For further information apply to J. W. Durham, Ripley, Tenn.

AN invention has recently been introduced for the purpose of increasing the illuminating power of gas. The apparatus is simply a thin disk of some incombustible material—glass, porcelain, or metal—which is pierced with one or several holes, the apertures or aperture being proportioned to the diameters of the different burners. The size of the pierced disk may be the internal diameter of the chimney, so that it may be fixed at the upper part; or it may be a little larger, so that it may be placed directly upon the chimney.

Singular Periodical Mortality of Fish.

In the *séance* of the 11th April M. Duchemin brought before the Academy of Sciences of Paris the following curious fact in Natural History: In the park of the Château de Montigny (Eure) belonging to M. Deroche, there is a large piece of water, through which a gentle current of beautifully clear water flows. In this lake numerous carp are reared, which thrive well, except during the first days of spring, when each year an extraordinary mortality occurs amongst them. In each animal one morbid symptom is always observable in the dead animals as they float on the surface of the water. In every case the animal is blind; a kind of film covers the eyes and even a part of the head. An examination of the body brings to light no internal disease, beyond a slight fatty degeneration of the tissues. The viscera appear healthy, and contain no intestinal worms. The cause of this strange malady has not hitherto received any notice; but from M. Duchemin's researches, in conjunction with M. Deroche, it seems that the toad (*Bufo calamita*) is an enemy, if not of all fishes, at least of the carp in spring. It attacks it, exhausts it, conquers, and kills it. To determine the point, they examined all the carp in the pond, and found squatting on the head of each of those that were diseased an enormous toad, the fore-paws of which were placed on the two eyes of the unfortunate fish. Thus, this ugly Batrachian, which presents so stupid an aspect, has yet sufficient intelligence to assume the offensive, and to overcome a large fish. If it has not agility and energy, it has cunning and perseverance. It would appear to kill by exhaustion, but it remains to be ascertained whether the acrid secretion of its skin assists in the conquest.

In a still more recent *séance* of the Academy of Sciences, M. Duchemin, reverting to the above communication in regard to the mortality of the carp being in some instances due to the attacks of the toad, supplies observations which have been forwarded to him in support of his statements, and relates that from investigations undertaken at the Château de Montigny, the toad does not always remain permanently fixed on the head of the dead fish, but only so long as it gives signs of life. He observes, too, that all the carps from which the attacking toads had been removed were more or less blind. They were placed with care in another pond, but none of them recovered from the injuries received. No author has hitherto noted this animosity of the toad for the carp, who perhaps themselves consume the eggs of the toad. He has obtained additional evidence from M. Mermet, Directeur des Eaux at Contrexville (Vosges), who states that it has been found impossible to preserve carp in a sheet of water in that neighborhood in consequence of the presence of numerous toads. M. l'Abbé Caillet, Curé of Rosoy (Haute Marne), whilst confirming the above statements, writes to him, "The toad is a villainous beast. One day I observed one that had crawled beneath a hive. There, with his two forepaws advanced and his throat wide open, he attracted the innocent bees, with which his sides were distended."—*Nature.*

Weights of Different Figures of Wrought-Iron and Steel.

RULE 1. *For Round Iron.*—Multiply the square of the diameter in inches, by the length in feet, and by 2·63, and the product will the weight in pounds, avoirdupois, *nearly.*

RULE 2. *For Square Iron.*—Multiply the area of the end of the bar in inches, by the length in feet, and by 3·36; the product will be the weight in pounds avoirdupois, *nearly.*

RULE 3. *For Square, Angled, T, Convex, or any figure of Beam Iron.*—Ascertain the area of the end of each figure of bar, in inches, then multiply the area by the length in feet, and that product by 10, and divide by three; the remainder will be the weight in pounds avoirdupois, *nearly.*

RULE 4. *For Square Cast Steel.*—Multiply the area of the end of the bar in inches, by the length in feet, and that product by 3·4; the product will be the weight in pounds avoirdupois, *nearly.*

RULE 5. *For Round Cast Steel.*—Multiply the square of the diameter in inches, by the length in feet, and that product by 2·67; the product will give the weight in pounds avoirdupois, *nearly.*—*Warn's Sheet-Metal Worker's Instructor.*

THE Viceroy of India recently visited the ancient salt mines of Pind-Dadun-Khan, in the Punjab, 110 miles northwest of Lahore. These mines are interesting as dating from the days of Alexander, and as being worked by the actual descendants of the original miners. One of the mines (nine in all) contains a circular hall 90 feet across and 40 feet high The supply of salt seems inexhaustible.

A CONTRACT has been signed by the Turkish Director of Telegraphs and Mr. Galotti, for laying a submarine cable between Constantinople and Odessa. The line is to be open for traffic within a year from July 1, 1870.

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The Carrier Potato Digger.

Our readers are pretty generally informed how long and arduously inventors have sought to produce a potato digging machine which should work satisfactorily in all respects, and what ill success has attended the greater number of these efforts. Now it was the dirt which clogged, and again it was the vines which tangled, or perhaps it would only work when the soil was extremely dry. The difficulties have been numerous, yet the inventor of the machine herewith illustrated claims to have surmounted them all, and to have produced a machine that is thoroughly practicable, and one by which six acres per day can be dug by any farm team.

A shovel, A, Figs. 1 and 2, which is attached to the body of the machine, scoops up the whole hill to the depth of five or six inches, or to whatever depth may be requisite, it being adjustable to any required depth.

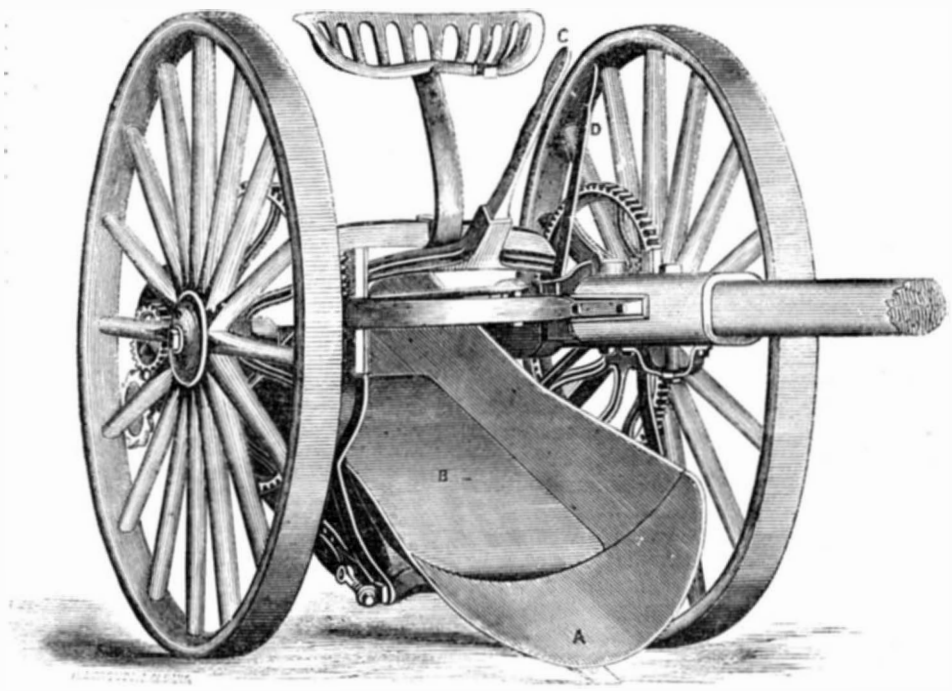
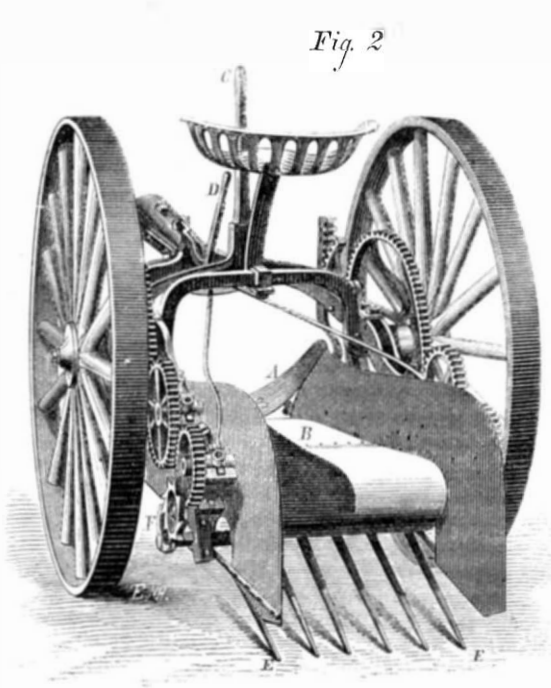


Fig. 2



THE CARRIER POTATO DIGGER.

The potatoes and dirt thus scooped up are pushed back upon an elevator, B, which consists of an endless belt or apron shown in the rear view of the machine, Fig. 2, and also in Fig. 1.

This apron carries the mingled soil and potatoes back to a series of fingers, E, Fig. 2, which, by a series of radial wipers, shown at F, is made to rise and fall with a jerking motion, by which means the potatoes are separated from the soil and left in a continuous row upon the top of the ground, at the rear of the machine. Behind the wiper wheel, is a small pinion which meshes into the large cog wheel above, A hook or finger at the end of the shaker shaft rides over the wipers, and gives motion to the shaker.

The lever, C, is used to raise the shovel when it is desired to move the machine from place to place in intervals of work, and the lever, D, is used to run the shaker out of gear.

The machine has been thoroughly tested, and testimonials from a number of practical farmers vouch that it does all that is claimed for it. In an experiment at Mentor, Ohio, seven citizens who witnessed the trial attest that although the soil was in a bad condition, being very wet, the machine dug potatoes at the rate of five or six acres per day, digging the potatoes as well as the work could be done by hand, for which reason they unanimously indorse the merits of the machine in the warmest terms.

We think the machine embodies the correct principle upon which depends the successful construction of a machine for digging potatoes; namely, the combination of a scoop for raising the hills, with an endless apron for carrying them back, and a vertical movement of the shaker which separates the dirt from the tubers; and therefore, though we have not seen the machine in operation, we think it will accomplish what is claimed for it. It is perfectly simple in its construction, and not likely to soon get out of order. Patented June 15, 1869.

For further particulars address J. T. Carrier, 658 Broadway, Albany, N. Y.

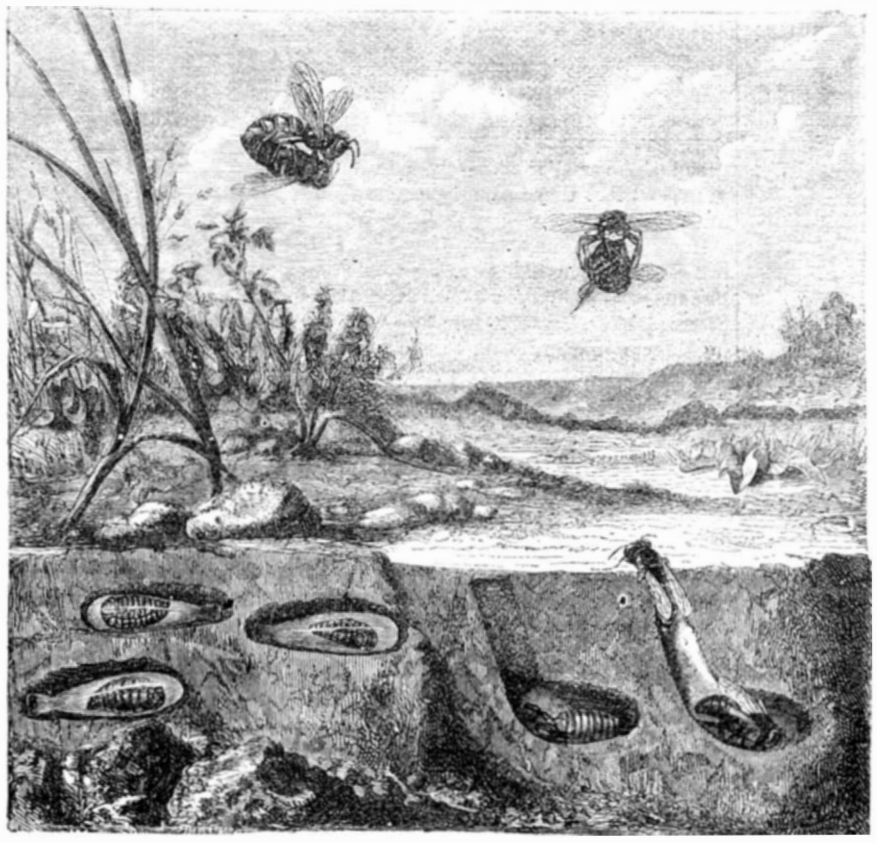
[For the Scientific American.]

By Edward C.H. Bay, of the School of Mines, Columbia College].

THE BEE-EATING SAND-WASP.

In our last article we wrote of stinging Arachnids; in this we propose to say a few words about stinging insects. Does it not sting? or is it not venomous? are questions that are constantly asked of the collector, of almost any insect that he may chance to point out to the uninitiated; such people—and they are the vast majority—appearing to entertain the idea that insects as a rule are to be dreaded on account of their poisonous properties. In reality, however, there are but few insects, comparatively speaking, that possess venomed stings; whilst wounds from bites are only inflicted by the members of two orders out of seven. The popular fallacy appears to arise from the fact, that the insects that do sting or bite mankind are amongst the ones most familiar to us; and also from the repulsive or formidable appearance presented by many, that are in reality perfectly harmless. To make the comparative scarcity of the kinds of dangerous or annoying insects more apparent, we will enumerate the chief orders and the facts relating to each that bear upon this matter.

Aristotle, amongst the ancients, drew the distinction that in the two-winged flies the sting was in the anterior part of the body; in the four-winged it was in the rear; but this generalization hardly extends far enough for our modern ideas, nor is it sufficiently exact. A bite is by no means synonymous with a sting, and the distinction applies only between Hymenopters and the flies properly so called. Among the *Neuroptera* or "nerve-winged" insects, of which the dragon-fly is an example; the *Orthoptera* or "straight-winged," such as grasshoppers; and the bettles, three orders the members of which possess biting jaws, sometimes of very formidable proportions; we find no insects that inflict anything more than a momentary nip if incautiously handled. A few beetles, however, are capable of discharging an acrid secretion of a more or less irritating nature. A small black beetle that, on occasional nights in July and August, swarms into our houses, attracted by the lights, is remarkable on this account. If one of them be interfered with whilst crawling over the bare skin its acrid discharge produces a very uncomfortable smarting sensation, accompanied by a reddening and slight inflammation of the spot affected, and these disagreeable symptoms endure for several hours. The irritating properties of the blistering-beetles or cantharides, belonging to this order, are known to every one. The Lepidopters, or butterflies, again are quite innoxious in the perfect form; and it is only in a very few instances, that the hairs of their caterpillars possess, as described in a former paper, irritating powers.



METAMORPHOSES OF THE BEE-EATING SAND-WASP—*Philanthus Apivora.*

But in the Hemipters or "bugs," and the "Dipters" or two-winged flies, we find to our frequent cost a very elaborate mechanism for piercing our skins and sucking our blood, and thereby inflicting upon us a more or less disagreeable wound. Such bites are however said not to be venomous, that is, no venom glands have in either order been found in connection with the armature, which is rather for the purpose of feeding than for defense. The irritation that accompanies the bite of a fly or a bed-bug is attributed to the nature of the wound made by the elaborately contrived lancets. We venture to think, however, that something in the nature of the insect must affect the persons bitten, as the effects produced on different individuals are so diverse; thus one person will be greatly inconvenienced by the bite of a bed-bug and not at all by the bite of a flea, while in another it will be exactly the reverse. It seems impossible to account for this fact on the theory of simple mechanical injury. Again, it is a common joke that mosquitoes prefer foreigners, originating from the fact that persons lately arrived in the country suffer most from their bites. We know that one may in time become "naturalized" to the bites, but we can hardly realize a man's body becoming habituated to having fine needles periodically run into it without producing the same irritation at the last as at the first. Moreover we have noticed a peculiarity in mosquito bites that we have not in those of other insects—that their effects are intermittent. The effects may last for several days, but the irritation and pain will only recur at intervals, and most notably, as it has seemed to ourselves (and to others), at about the return of the hour at which the bite was inflicted. Now the mosquito is bred amidst decaying vegetable matter, in stagnant waters, and it flourishes amidst the very hotbeds of malarious and intermittent diseases. Can it be that the mosquito contains in its juices traces of a poison miasmatic in its nature? and may not the nature of the birthplace account for the greater or less virulence of the effects of the bite? This matter of whence an insect comes, suggests unpleasant thoughts about biting flies. When they swarm around us in summer we cannot get rid of the involuntary question, Where did they alight last, or upon what did they last feed? We have a shuddering dread that these summer pests, like a dirty paper currency, must be efficient aids in the dissemination of disease.

We have now only left one order, the Hymenopters or "membrane-winged," and it is in these insects alone, that we find a sting connected with poison glands and situated at the end of the hind body or abdomen. Nor do we find this in all the members of this one order, for in a large number the sting is represented by a piercer, used to aid in the safe disposition of the eggs; and in those kinds in which the poison glands are present, they are confined to the females and neuters. This sting serves mostly as a weapon of defense, but in many cases is also an aid in securing prey. Such is the case with the insect figured in the accompanying engraving—the Bee-eating Philanthus or sand-wasp; but the prey which it obtains by the use of its sting is not for its own immediate purpose but as food for its offspring. The proceedings of this insect are most graphically given by Professor Blanchard. The Philanthus awaits on a flower the arrival of a bee coming in search of pollen, it watches its opportunity and suddenly pounces upon the honest gatherer; "it seizes her with its mandibles between the head and the thorax and almost always succeeds in turning her on her back and in piercing her with its sting. The bee makes the most energetic resistance, but the Philanthus is the more agile and rarely fails in its attempt. After being stung the bee writhes a few times convulsively, endeavors to strike with her sting, extends her proboscis, and the next moment ends by falling lifeless. The assassin then taking up her victim with her mandibles and between her feet flies off with her heavy burden." She carries her victim to her nest, a gallery excavated in the earth, as represented in the engraving, deposits her load therein, lays an egg in the dead body and retreating, carefully walls up the entrance to the vault. The whole history recalls the most cold-blooded of human murders! By and bye the egg is hatched and the helpless, inactive offspring of the sand-wasp finds itself born amidst a supply of fitting food. In the cavity to the right of the center of the engraving the grub is represented finishing its store, only a few fragments of the bee being still left. "It has completed its growth in devouring its bee; it then constructs for itself a silken cocoon, almost transparent—this cocoon well deserves a description that has hitherto never been given of it; it is a veritable little elongated bottle, with its bottom rounded and its neck well defined and appearing to be sealed with black wax!" M. Blanchard can not see these ce-

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coons without thinking of the stock-in-trade of a homeopathist; for our part we seem to read here a sad sarcasm on humanity—the bottle containing the elements of the future robber and assassin. But the Hymenopters in the variety and strangeness of their powers and instincts give us endless lessons, and we propose on a future occasion to select some details regarding this interesting order.

[For the Scientific American.]

THE MAMMOTH CAVE AND THE CAVE REGIONS OF KENTUCKY.

TILGHMAN B. VESTAL.

Thousands of tourists visit the Mammoth Cave annually, and it is a good place to appreciate subterranean mystery. Not only the business man and mechanic, but the chemist and geologist are overwhelmed with wonder by this grand display of nature.

The chemist says that its origin is due to the solvent action of water holding carbonic acid in solution, and that this cause has been assisted by the mechanical agency of running water.

The geologist traces the stratification and lamination of rocks indefinitely, and by means of fossil shells found imbedded in the solid rock, determines that they belong to the silurian system.

The philosopher attributes the want of eyes in the fishes to the absence of light; but the formation, from dry gypsum, of thousands of snowballs and roses which adorn the ceiling of Snowball Room, and Cleveland's Cabinet, and the Geologist's Puzzle of Indian Cave, defy explanation. The Geologist's Puzzle is a rock projecting six or eight feet obliquely from the bed of what was formerly a river covered with very delicate stalactitic crystals, while other rocks level with it, and but a few feet distant, are worn perfectly smooth. Humbuggery in the case of this puzzle is apparently impossible.

The Mammoth Cave is probably crossed by the Louisville and Nashville Railroad, but the present entrance is seven miles from the nearest station, namely, Glasgow Junction. Although the total length of all the avenues of this cave has been estimated to exceed one hundred miles, it does not comprise the entire cave regions. It is estimated by Mr. Proctor, who lives at Cave Hotel, that there are two hundred caves within ten miles of his residence.

Many of these smaller caves contain a great abundance of beautiful crystalline specimens of stalactites and stalagmites, which are by far superior to any in the noted Mammoth Cave.

The formations in Indian Cave are grand beyond description; they assume every variety of form, from round to thin translucent sheets, resembling a curtain which extends from floor to ceiling.

The most important of these minor caves are, Indian, Diamond, Proctor's, and White's. Indian Cave was discovered in 1861 by B. R. Young, Jr., who was at the time a boy eleven years of age. He descended by means of a hole fifteen inches in diameter, through a rock ten feet thick. A larger entrance was made by digging away the dirt at the edge of the rock, and the cave has since been open for visitors.

This, and probably many others, have impassable communications with Mammoth Cave.

The temperature of these caves is uniformly about fifty-nine degrees. Accordingly in winter, when the outer air is colder, it is more dense, and air is forced into the cave. In summer, when the outer air is warmer, it is more rare, and an outward draft is formed. This motion of the air ventilates the cave, and renders its atmosphere salubrious and bracing, it is called the cave's respiration.

This underground tour is divided into two routes, the short and the long. The long route cannot be made in winter because of high water in Echo River. Sometimes the water rises sixty feet; but a rise of eighteen feet cuts off all communication beyond the river.

A young married couple and a guide were lost in a cave in Missouri by the sudden rise of a stream while they were beyond it. The cave was filled to the ceiling, and they were never heard of any more. Nothing of this kind has ever occurred here; the guides are trustworthy, and never lead people into danger. We visited the cave early this season when the draft was inward. Two guides were necessary as ours was the first trip across the river since last fall.

About 8 o'clock we left the hotel, and three minutes' walk brought us to the entrance. Lamps were lighted and placed directly in front to prevent their being extinguished by the draft. The foremost guide, giving a gentle hint to the whole party, cries to his comrade in the rear, "Come on, Saint, we are all young, and we'll make it easy."

After traveling one mile, we saw the vats that were used for making saltpeter for powder to carry on the war of 1812.

The Rotunda was the first large room we entered. The Chapel and Acute Angle are, indeed, spacious halls. The Star Chamber looks exactly like the heavens on a starry night when we go out and look a long time into their blue. The Moon and Comet, too, are there.

The guide takes all our lights, and, going behind a ledge of rocks, permits the reflection to give just light enough to make the illusion complete. Then, as he, holding the lights before him, ascends a hill, the morning dawns, the sun rises, and it is again day in our ideal world. But, alas! a storm arises, and the day is darkened by huge black clouds which fill the soul with doubt. These clouds are formed by immense shadows, which, owing to their intense darkness, want but the flash of lightning and roar of thunder to finish our subterranean cloudy day. Standing at one point we look down into two pits which appear fabulous in dimension. When illuminated by a Bengal light it wearies the eye and exhausts the imagination to look into their depths. Above, below, beyond—all is vast and wonderful. It is the most enrapturing, soul-reviving scene ever pictured. It seems that nature has been endeavoring to create a universe within a world of rock. All ideas of vastness are bankrupted in beholding the most imposing and stupendous objects eye ever witnessed.

We crossed the River Styx and Lake Lethe in boats, and passed over great sand walk to Echo River, "but how shall I speak of it?" Oh, the beautiful sounds which echo up, down, and across the smooth water as we merrily glide over its crystal form.

The stillness and evenness of its surface, arched, as it is, by huge rock, dividing it into a thousand rooms and avenues, render it a most propitious hall for music. A single word sounds, resounds, and re-resounds till it comes back converted into the most harmonious notes.

After a ride of one half mile, we climbed the bank on the opposite shore and entered Cascade Hall, which is a large room containing a waterfall. We were now nearly four miles from the mouth of the cave, but were not fatigued in the least; the pure atmosphere and the exciting views give an astonishing vivacity, even to invalids. On we passed, through domes, over hills, and across valleys, all of which had appropriate names, such as Mammoth Dome, Rocky Mountain, and Dismal Hollow. Rocky Mountain is one hun- feet high, and is formed entirely of rocks that have fallen from above. On the summit there is a stalagmite two feet high and six inches in diameter, called Cleopatra's Needle.

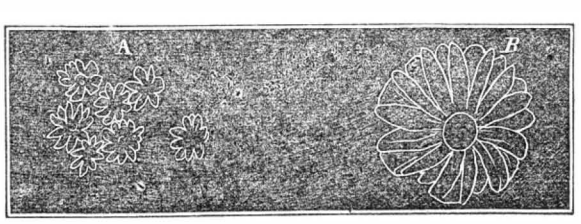
For long distances we stepped from rock to rock, where misplacing the foot three inches would have occasioned a fall. The most fearful place is a ladder over Dead Sea, where one step would precipitate you a hundred feet. It is strange, but timid ladies ascend and descend without assistance or fear. A reverent awe, attended by a cautious habit, seems to take the place of fear, and still it prevents accidents.

Seven miles from the cave's mouth we find Martha's Vineyard, which contains stalagmites running up the wall exactly like a grape vine. Nodules of carbonate of lime, colored by black oxide of iron are on and around the vine, resembling bunches of grapes.

The most beautiful parts of the cave are, Snowball Room and Cleveland's Cabinet. "The ceiling of the former is covered with pure white nodules of gypsum, varying from two to four inches in diameter, which, viewed at a distance of twenty feet, cannot be distinguished from the snowballs that grow in the flower garden.

"Cleveland's Cabinet is nearly two miles long, sixty feet wide, and from ten to twenty in hight." The walls and ceiling are literally lined with alabaster flowers of every conceivable variety and indescribable beauty. The rosettes vary from one fourth of an inch to eight inches in diameter.

One of the guides said that he had noticed a particular



group of the smaller ones—given in the figure—for twenty years, and that they had not perceivably increased in size or numbers.

How very old must be the Last Rose of Summer, B, which is eight inches in diameter. These flowers grow, no doubt, like the crystal, by the addition of particle to particle. The process is slow, but there is nothing to impede: "Time's effacing fingers" sweep no lines here, for where there is no variation of temperature, no water, and no light, the three great forces of geological transformation cannot operate. Although nations, kingdoms, and empires have passed away, leaving these beauties for coming generations, there are those among the thousands who visit the cave, who fain would tear the gems from their mother earth and leave her as bare and ugly as themselves.

Different parts of the avenue are named Mary's Bower, Diamond Grotto, The Cross, Bacchus' Glory, and the Dining Table.

The Pass of El Ghor presents a very broken appearance. It is two miles in length, and communicates with Mystic River, a body of water the extent of which is unknown. Pits one hundred and seventy-five feet deep, may be seen from top to bottom by throwing into them a lighted paper ball saturated with coal oil. Some of these pits have avenues leading from them at various depths which have never been explored. We have not attempted to describe more than one tenth of what is now known of the Mammoth Cave. No two avenues or rooms resemble each other, yet a description of their lengths and breadths given in feet or miles would become monotonous, and "their grandeur to be realized must be seen."

Although there are some curiosities in the cave which are not well understood, yet as the scientific man is conducted through its lengthy halls and majestic domes he peeps, as it were, into the very heart of the earth, and reads from the bosom of nature those well-established geological facts relative to the structure of the earth. Lovers of the sublime and beautiful have a wide scope here, and the soul of the meanest is made to expand with love as he beholds these noble works of God.

IT is said that the first horse ever seen in Canada was brought to that country from France, in a ship which arrived at Tadoussac, on the 20th of June, 1647.

Adjustable Car Wheels.

There arrived here recently from New York, *en route* to San Francisco, a car belonging to the New York & Erie Railroad, which is on an experimental trip. To run a car through from ocean to ocean, it is necessary to accommodate its wheels to the different gages over which it will necessarily pass; and while the idea of cars with adjustable gage wheels is by no means a novelty, the construction of the car mentioned is new and worthy of description.

In all devices heretofore used for changing gage, grooves have been cut around the axle according to the number of changes necessary to be made. It is claimed that these notches destroy the strength of the outside fiber of iron, and consequently weaken the axle. The device on the car which arrived yesterday obviates this trouble, by inserting a steel feather key laterally on the axle and thus securing the wheel at any point desired by means of a band at each end of the hub, fitting in notches on the key. The "feather" extends into the axle five-eighths of an inch. The car was built in New Jersey and freighted with boots and shoes. Mr. W. B. Snow, the inventor of this new patent, has accompanied the car from the East here, and will continue with it until it arrives at its destination. The trip thus far has been entirely satisfactory, and the inventor looks forward to a safe arrival at the Pacific, when the utility and practicability of his device will, he thinks, he satisfactorily demonstrated. If successful, the Erie company will put 1,000 cars with this device on the freight line between New York and this city.—*Chicago Evening Post.*

American Institute of Civil Engineering--Annual Convention.

The second annual Convention of the American Institute of Civil Engineering was held on the 15th inst. at the Chamber of Commerce. The present officers are: Alfred W. Craven, President; A. P. Boller, Secretary; and James O. Morse, Treasurer. Over fifty gentlemen were present—among them, Gen. Barnard, Col. Adams of Brooklyn, Horatio Allen, J. D. Steel of Pennsylvania, W. J. McAlpine, and W. E. Worthen.

After some ordinary business had been disposed of, the President reviewed the immense strides the Institute had made within the last three years. Established in 1852, it struggled for a few years, in spite of drawbacks, till it died a natural death in 1856. In 1867, a dozen of the old members reorganized it on a new basis, and since then its progress has been remarkable—179 members are now on the roll, and comprise nearly every engineer of note in the States; its library is so extensive that the bookcases will not hold the works, while the papers read are of great importance, and their publications are sought after by every kindred society here and in Europe. There are 52 subscribers to the fellowship fund to aid in the publication of its papers, including A. A. Low, W. B. Ogden, W. H. Aspinwall, W. G. Fargo, A. S. Diven, and J. Howland.

After the President's address, W. J. McAlpine read a paper on the "Waves of Translation in Fresh Water," in which were embodied some remarks on the construction of reservoir dams and the causes of leaks in canals.

Mr. F. C. Lowthorpe made a long address on the "Use of Cast and Wrought Iron in Bridge Construction," and exhibited a diagram of one built by him in 1856, and which was the first of the kind erected in America and is now standing as solidly as when first built.

Mr. J. W. Dutton Steel made some remarks on the "use of compressed air as a motor," and was of opinion that compressed air would eventually take an important place as a motor. It has been tried in mines in England with such success that 100 miles of shaft are already under construction, and he trusted that its use as a motor in underground traffic would soon be considered seriously. Its advantage over steam is under certain conditions incalculable.

After some remarks by several present, Gen. Barnard described the "Construction of Fort Tompkins Wharf," and maintained that, in spite of all said to the contrary, the old method was the best.

He was followed by Mr. Squire Whipple, who made a short address on "Iron and Truss Bridges," and, after a well prepared paper on "The Transmission of Sand by Water from a Caisson," had been read by Mr. Collingwood, in which he proved conclusively that not only coarse sand but pebbles can be removed from a dam by a current of water, the meeting adjourned.

Opening of Connecticut River Railroad Bridge.

The New York and Boston Shore Line Railroad bridge over the Connecticut River was formally opened on June 11. The length of the bridge is 1,130 feet, and it cost about $225,000. The substructure consists of fourteen column piers to support the stationary spans, besides the abutments at the shore ends, and eleven column piers to support the turn-table and swing span. Each column pier is formed by driving a number of piles in close proximity, covering in the aggregate an area of five feet square. The piles are firmly bolted together; iron cylinders, some seven or eight feet in diameter, are then let down in sections over the piles so as to completely surround them, and the space between the cylinder and piles is filled up with concrete.

The stationary spans are constructed of wood and iron on the truss principle. With the exception of the flooring, which is of wood, the swing span is of wrought iron; it is built on the Pratt style, is 280 feet long, and can be turned by two men. The bridge will bear a strain of 2,500 pounds to the running foot; but the breaking weight is estimated at about five times the bearing strain. Although the weather was unfavorable, the opening ceremonies passed off very pleasantly.

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Grinding Edge Tools.

The *American Builder* thinks that in finishing the grinding of cutting tools, the stone should revolve toward the edge of the tool. This is its argument:

Edge tools are fitted up by grinding, very much as a plank would be reduced in thickness, were a large plane employed, in which were set a hundred or more very small gouges, each cutting a narrow groove. The sharp grit of the grindstone being harder than the iron or steel, cuts very small channels in the surface of the metal, and the revolving disk carries away all the minute particles that are detached by the grit. If we were to examine the surface of a tool that has just been removed from a grindstone, under the lenses of a powerful microscope, it would appear as it were like the rough surface of a field which has recently been scarified with some implement which formed alternate ridges and furrows. Hence, as these ridges and furrows run together from both sides, at the cutting edge, the newly ground edge seems to be formed of a a system of minute teeth, rather than to consist of a smooth edge. For this reason, a tool is first ground on a coarse stone, so as to wear the surface of the steel away rapidly. Then, it is polished on a wheel of much finer grit. And finally, in order to reduce the serrature as much as possible, a whetstone of the finest grit must be employed. This gives a cutting edge having the smallest possible serration. A razor, for example, does not have a perfect cutting edge, as one may perceive by viewing it through a microscope. And yet, the serrations are actually so much smaller than a human hair, that the minute teeth cut the hair in twain. But, when the serrations on the edge of the razor become so battered up and dull that they will not sever a hair, or cut a man's beard off, the edge must be honed and strapped until the system of minute teeth will be so much smaller than a hair, that several of them will take hold of the smallest hair at once. These suggestions will furnish something of an idea of the operation in grinding and whetting edge tools.

Beginners are sometimes instructed, when grinding edge tools, to have the stone revolve toward the cutting edge, and sometimes from it. When the first grinding is being done, it is a matter of indifference whether this is done or not. But, when the finishing touches are applied near, and at the very edge, a grinder can always complete his task with more accuracy, if the periphery of the grindstone revolves toward the cutting edge, as the steel that is worn away will be removed more easily. Whereas, when a stone runs in the opposite direction, the grinder can not always tell exactly when the side of the tool is fully ground up to the edge. This is more especially true, when the steel has a rather low or soft temper. The stone, when running from the edge, will not sweep away every particle of the metal that hangs as a "feather." But, when the stone revolves toward the edge, there will be no "feather edge" to deceive the eye of the grinder.

Chinese Vehicles.

A contributor to the *Coach-Makers' Monthly* describes in a humorous manner the vehicles used by the Chinese. He says: "The vehicles used for the journey are carts, one to each man; and each cart drawn by two mules. The hubs of the carts, although designed to carry but one man and the driver, are as large as those of our strongest drays in the United States, and the wheels as strong and full of rivets as the wheels in Ezekiel's vision were of eyes. Through these ponderous hubs the axles project for a distance of seven inches, being three inches in diameter where they come through. What good this projection of the axle does, except to hit against everything in the way, belongs to Chinese civilization to determine. On to these axles, which are very heavy and strong, are attached heavy frames, made of two scantlings running from the mules' heads across the axle, to which the frame is made fast by strong bands and bolts of iron. There is nothing in the shape of a spring, or thorough-brace, or any such thing. The Chinese have not got along to these things yet in their civilization. On to this frame is fastened the thing to which you are to be imprisoned during your trip to the capital of the Celestial Empire. It is only large enough for one person, who is expected to sit with crossed legs on the bottom of the machine.

"This strange cage is a kind of a cross between a hen coop and a dog kennel. It is made of hard wood, and very strong, the sides being made to resemble the windows in a penitentiary, the checkered bars being of hard, strong wood instead of iron. There is no seat of any kind, nor anything on which you can lay hold to steady yourself, as a protection against the terrible jerks you suddenly get from side to side as your cart drops into the ruts of ages, and is jerked out again by mule power. Your prison somewhat resembles an old-fashioned Pennsylvania or Kentucky freight wagon, bating the size, only the ribs of your inclosure are much nearer together and stronger. Then over all is placed a covering of strong, blue cotton muslin, to prevent the rain or dust from coming in, or you from seeing out except in front. This cover is made to come down in front of you, so that you must crouch to see out even in front, like a dog looking out of his kennel, or a chicken looking out from under the old hen on a rainy day. You must first get on to the shaft, and then crawl backward through this hole to your quarters.

"Bed and bed-clothes, carpet-sacks and shawls are packed away in this little cramped concern, and you endeavor to adjust them so that your bones may escape being broken against the rough sides of your narrow cage. But the roof is so low that if you put in enough to make anything like a comfortable seat, your head will hit against the top, and if your head barely escapes the top of the roof in the middle, it will be sure to hit the sloping sides as soon as the lateral motion begins, and that is the moment the cart gets under way."

Mosaic and Enamel.

Mosaic is a kind of inlay, producing a picture or pattern by the due selection of colors in the pieces employed. The substance may be wood, stone, marble, porcelain, terra-cotta, enamel, or colored glass; and it may be cut into cubes, hexagons, triangles, or various other forms; the chief conditions being that the pieces should be small in size, variously colored, and placed in such juxtaposition as to bring the proper tints into the proper places. The marble pavement under the dome of St. Paul's, the wooden flooring and paneling done in marquetry, the inlaying of cabinet work known by the names of marquetry and buhl work, the intricate patterns of Tunbridgeware toys, the nicely fitting lids of Scotch snuff boxes—all are examples of mosaic so far as the principle is concerned; but it is generally meant, in art, that a mosaic is a picture, which must have the mind of an artist thrown into it before the mechanical working begins.

Enamel is really nothing more than opaque glass, the opacity being produced by the addition of some one or more among many metallic oxides to the other ingredients. According to the color required, so is the metallic element chosen—lead or antimony to produce yellow, iron to produce red, gold for a more intense and beautiful red, copper for green, cobalt for blue, and various combinations for other colors. Enamel paintings are plates of copper, silver, or gold, on which the picture is produced by using the enamel in the form of paint, and then vitrifying it by the heat of an oven. Enameled watch dials have a thin coating of white enamel on a copper disk or plate, while the figures and spots are painted in black enamel, vitrified by heat.

Now the use of enamel for mosaic is simply the substitution of cubes or small pieces of colored enamel for pieces of other substances. They are occasionally employed, like colored glass, with a part of the effect due to semi-transparency; but more frequently they are quite opaque, only to be looked at by reflected light. The beautiful Pompeiian mosaic of the "Battle of Issus" is of enamel. The mosaics of St. Peter's are also of enamel. So numerous are the gradations of tint necessary to produce all the lights and shades of an elaborate picture, that the mosaic workshops at the Vatican are said to contain no less than twenty thousand varieties, all methodically sorted and arranged. Some of the larger and more ambitious works have taken ten, fifteen, or even twenty years to execute. The durability of the material is fully as great as that of stone itself; insomuch that the mosaic pictures of St. Peter's, so far as atmospheric or climatic influences are concerned, may possibly last as long as the structures which they adorn. The mode of proceeding is pretty much as follows: A ground or support is prepared, either a metal plate or a slab of travertine, the proper size and shape of the picture; and this is surrounded with a raised rim of iron. Into the recess thus formed is introduced a cement or stucco mixed to a pasty state, and consisting of pounded travertine, carbonate of lime, mastic, and linseed oil. The tesseræ, cubes, or small pieces of enamel (some barely larger than a pin's head) are selected of the proper colors, tints, and shades, and imbedded one by one in the cement. Only so much cement is laid in as can be filled with tesseræ in one day, in order that it may retain sufficient softness. It eventually hardens to the consistence of stone. When the whole picture is finished, the surface is rubbed smooth and made dull or polished according to the kind of effect intended to be produced.

The Gloss on Silk.

"The method of giving an artificial gloss to the woven pieces of silk," says the *Druggists' Circular*, "was invented in 1663. The discovery of the method was purely accidental. Octavio Mey, a merchant of Lyons, being one day deep in meditation, mechanically put a small bunch of silk threads into his mouth and began to chew them. On taking them out again in his hand he was struck by the peculiar luster which they had acquired, and was not a little astonished to find that this luster continued to adhere to the threads even after they had become dry. He at once saw that in this fact there was a secret worth unraveling, and being a man of ingenuity, he applied himself to the study of the question. The result of his experiments was the *procédé de lustrage*, or 'glossing method.' The manner of imparting the artificial gloss has, like all other details of the weaving art, undergone certain changes in the course of years. At present, it is done in this wise: Two rollers revolving on their axes are set up a few feet from the ground, and at about ten yards, in a straight line, from each other. Round the first of these rollers is wound the piece of silk, of twenty, forty, or one hundred yards in length, as the case may be. Ten yards of the silk are then unwound, and fixed by means of a brass rod in a groove on the second roller, care being taken to stretch the silk between the two cylinders as tightly as possible. A workman with a thin blade of metal in his hand daintily covers the uppermost side of the silk (that which will form the inside of the piece) with a coating of gum. On the floor under the outstretched silk is a small tramway, upon which runs a sort of tender filled with glowing coals. As fast as one man covers the silk with gum, another works the tender up and down, so as to dry the mucilage before it has had time to permeate the texture. This is a very delicate operation; for if, on the one hand, the gum is allowed to run through the silk, or if, on the other, the coals are kept too long under one place, the piece is spoiled. In the first instance, it would be stained beyond all power of cleaning, and in the second, it would be burned. None but trusty workmen are confided with this task; and even with the most proved hands there is sometimes damage. When ten yards of the piece have been gummed and dried, they are rolled around the second cylinder and ten more are unwound. This is repeated till the end. But the silk, with its coating of dry gum, is then stiff to the touch and crackles like cream-laid note-paper when folded. To make it soft and pliant again, it is rolled anew, some six or seven times, under two different cylinders, one of which has been warmed by the introduction of hot coals inside, and this is sufficient to give it that bright new look which we all so much admire in fresh silk."

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American and English Mowing Machines.

Reaping and mowing machines have now become standard implements on English farms, but in France they are still regarded somewhat as innovations; the lower rate of wages across the Channel having hitherto acted as a barrier to the introduction of labor-saving machines in agriculture. Wages, however, are rising in France, as in most other countries, and the attention, therefore, of agriculturists is directed to the best form of reaping and mowing machines. Several international trials of these machines are announced for the coming summer. The first came off last week at Bourges, 123 miles south of Paris, at which there was a very sharp contest between the English and American machines. The *Ironmonger* states that after a long and careful trial the award was given in favor of the English machine of Messrs. Howard, of Bedford, which in mowing an acre beat the far-famed American machines of Mr. W. A. Wood and Mr. M'Cormick by eighteen minutes. American manufacturers must look to their laurels.

Flies on Horses.

The *Journal of Chemistry* gives the following as a preventitive of horses being teased by flies: Take two or three small handfuls of walnut leaves, upon which pour two or three quarts of cold water; let it infuse one night, and pour the whole next morning into a kettle, and let it boil for a quarter of an hour. When cold it will be fit for use. No more is required than to moisten a sponge, and before the horse goes out of the stable, let those parts which are most irritable be smeared over with the liquor, namely, between and upon the ears, the neck, the flanks, etc. Not only the gentleman or lady who rides out for pleasure will derive pleasure from the walnut leaves thus prepared, but the coachman, the wagoner, and all others who use horses during the hot months.

THE MANUFACTURE OF CHLOROFORM.—According to the late Jas. Y. Simpson, there is a single manufactory of chloroform, located in Edinburgh, which makes as many as eight thousand doses a day, or between two millions and three millions of doses every year—evidence to what an extent the practice is now carried of wrapping men, women, and children in a painless sleep during some of the most trying moments and hours of human existence.

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Improved Sectional Mills.

We might fill more space than can be allotted to the present description, with comments upon the importance of mills for the pulverization of hard substances, and with even the briefest allusion to the various improvements by which the rude appliances of the ancients have been superseded, but we shall not attempt to discuss this fertile topic. Suffice it to say that the employment of iron and steel as a substitute for stone grinding surfaces is one of the most modern improvements in this field.

The earliest of these were made with a dress of straight fillets or grooves. The disadvantages of this style of dress, and the advantage of the sectional system, are so well set forth by the inventor in the general description of the mill, furnished by him as the basis of the present article, that we cannot do better than to use his own language upon this point. He says:

"It will be somewhat difficult to indicate all the peculiar advantages to be derived from the use of sectional grinding surfaces, without a personal examination of the machine.

"In nearly every form of iron mills heretofore in use, the grinding surfaces have been confined to a system of straight fillets or grooves. This form of dress was adopted and continued in use, not because it was the best form of grinding surface, but from the impossibility of casting a cylindrical grinder with corrugations and indentations, without making it too expensive for practical use. With such mills, having the old system of grinding surfaces, no matter what the nature of the substance to be ground, whether it was hard, greasy, and tough bones, grain, plaster, or brittle minerals—all was done with the same description of surface, or at least the variance was so slight that practically the operation was the same with all. With ordinary discernment, the merest observer may see that this common way was entirely wrong. Business demands, practical and imperative in their nature soon pointed the inventor of the sectional mills to the fact that changes in the system were necessary; certain results were desired, and they could only be obtained by the most thorough experiment. For grinding substances of given character, a definite configuration of surface was demanded; and as the substance to be ground varied in character and condition, so also must the appropriate surface be supplied. This general advantage was attained by having the grinding surfaces cast in sections. By this means any pattern of tooth suitable to the material to be ground could be furnished. The concave or shell in which the *outer* surface is placed, or the cone upon which the *inner* surface is placed, being turned upon a lathe to perfect truth of circle, insures the running of the machine with an exactness impossible to exceed by any other system.

"Another great advantage in the sectional system lies in the facility with which changes can be made—no part of the body of the mill having to be removed, but merely raised sufficiently by a screw to allow the sections to be slipped to or from their places. A change made thus in a few minutes, renders very obvious the advantage over the old system. Were the inner and outer surfaces each cast in one piece, it would involve the lifting of the heavy parts of the mill, so as to allow them to be placed in the inside, taking the work of several men and a delay of several hours to accomplish. In the sectional mills the work can be easily done by one man.

"A great advantage claimed for the sectional mills lies in the fact, that should a piece of iron (which in grinding bones is very probable) accidentally get into the mill, and the grinding surface be broken, the broken section or sections may be removed, and sound ones replaced, without the necessity of renewing the whole. Practical men will see that this is a saving of time and expense not easily over-estimated."

Perhaps no material tries a mill so much as raw bones. These are not only hard, but they also possess a toughness that renders them peculiarly intractable. The machines we are about to describe are in successful operation in the manufactories of the proprietors, in Philadelphia and Chicago, upon raw bones, where their great capacity and strength are demonstrated. The mills are also working upon guano, plaster, fire brick, sumac, bark, dye-woods, ores, fish scraps, etc., in other manufactories in Philadelphia, Chicago, and other cities. Their efficiency in grinding ores has been, we are informed, well tested.

Fig. 2 is a sectional view of the mill, by the inspection of which its construction will be clearly perceived, in connection with the following description.

In the larger sizes the lower grinding surface of the crusher is curved, in order that iron or other foreign substances than that which the mill is working on may be quickly discharged without injuring the dress when the pressure is made upon them; while in the smaller sizes the grinding surfaces are in a straight line, or at least not curved.

A, is the top breaker, with a projecting arm. This arm is varied in shape to suit different material. It is made to slip easily over a sleeve which fits snugly on the shaft, so as to protect the shaft from abrasion from the continued jar of the breaker, and it also obviates the need of renewing that much iron with every breaker.

The large screw-nut, B, is used to hold the breaker down to its place. This is a left hand screw and tightens itself in working.

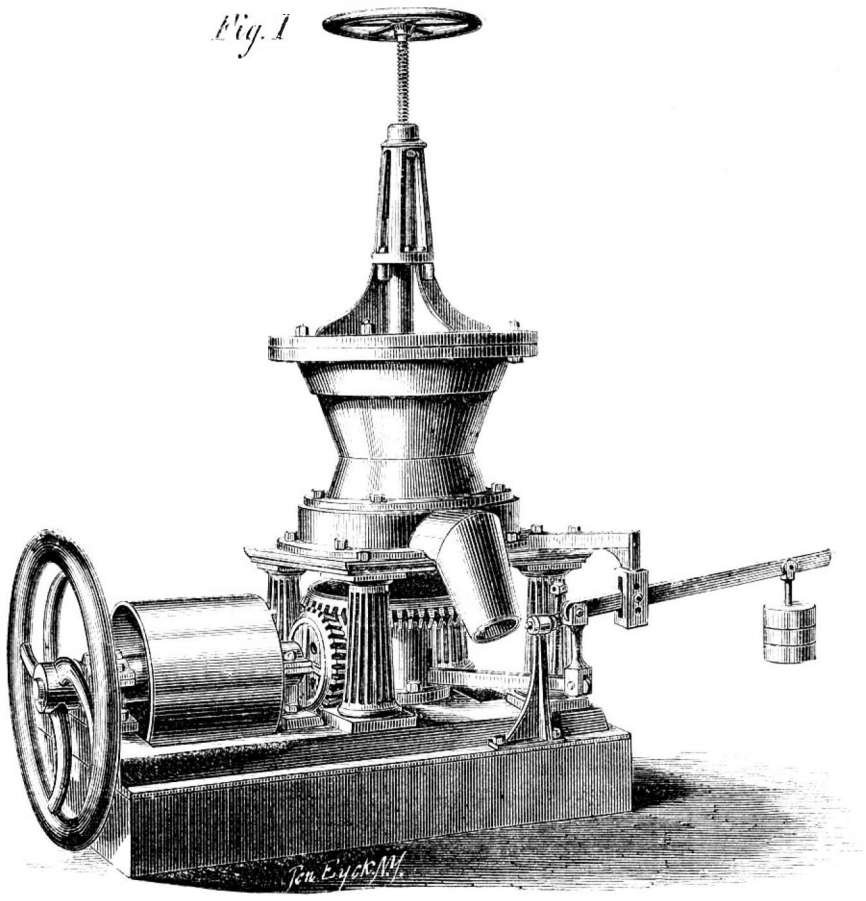
C is the circular grinder, with holes for stud-bolts (only one of which is shown) used to tighten the grinding sections, D.

E is the stationary sectional dress in the upper part of the shell, eight of which form a circle. The corrugations in these sections are made very deep, so as to admit of a great amount of wear. The lower or full sections, D, are eight in number, and are held in place by stud bolts, one of which is shown passing through C.

The outside or stationary sections, G, are held in place by the nuts, H. The circular shape of the bottom of the dresses marked D and G, admits of a great amount of wear at the bottom, where they come first in contact, and, should iron get into the mill, gives greater space on raising the lever to allow it to get out.

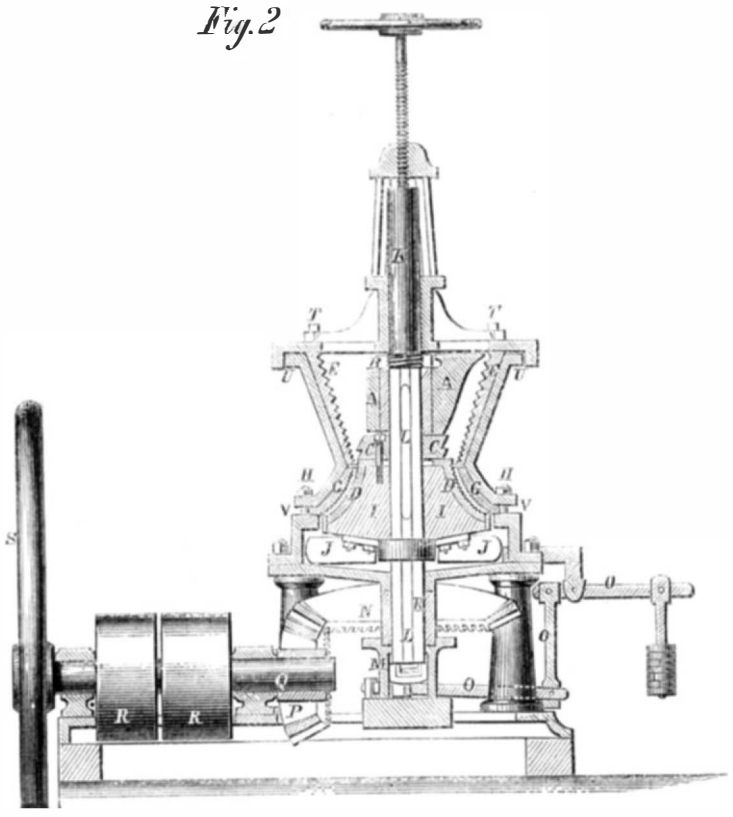
I is the cone to which the dress castings, D, are attached.

Fig. 1



E. P. BAUGH'S SECTIONAL MILLS.

Fig. 2



It has a heavy wrought-iron band around the base to support the dress, and is held in place by two feathers, L, in the shaft, and a tight collar below. Wipers, J, carry the ground material to the spout.

K is the perpendicular or main shaft, made of wrought-iron, the lower end of which, that works in the step, being made of solid steel. There are two feathers, L, let into it to hold the cone and breakers in place.

A steel, conical anti-friction disk is placed under the shaft, which effectually prevents heating. The step-box, which has a steel lining, is movable. The step moves up and down in a hollow column, M, in closing and opening the mill to adjust the grinding; the shaft working freely through the bevel cog-wheel, N, which is supported by M. Levers for adjusting the mill with weights are shown at O; or screws may be used in their place. P is the driving cogwheel, which being half the size of the other wheel, doubles the power of the belt.

Q is a wrought-iron counter shaft, to which are attached the fixed and loose pulleys, R.

S is the fly-wheel, which, with its shaft, is supported by pedestal boxes fitted with anti-friction metal.

The large screw at the top of the mill is used for raising the different parts to change the dress. In order to change the upper sections of the dress the bolts, T, are loosened, allowing the mill to be opened at U. To change the lower grinding surface, the bolts, H, are unscrewed, allowing the mill to be opened at V. Then the large nut, B, is loosened, and the breaker and sleeve are raised. Next the stud-bolts passing through C are unscrewed, when all the dress can be removed

The perpendicular or main shaft of the No. 1 mill is of wrought-iron, four feet six inches long and five inches in diameter. The counter shaft is also of wrought-iron, three and one-half inches in diameter. The fly-wheel weighs nine hundred pounds. The fixed and loose pulleys are twenty-two inches in diameter and ten inches face.

It will be seen that the proportions are such as to give great power and strength. This sized mill is intended to prepare all hard substances for smaller mills, although it is claimed that a large percentage of its product does not ordinarily require another operation. It weighs four tuns and is constructed sufficiently strong to crush rough raw bones, logwood (cut in lengths of 18 inches), the hardest quartz rock and all minerals, hard guanos, slag from furnaces, and, indeed, all substances which industrial science demands to be reduced. It is claimed that the hardest substance susceptible at all of grinding or breaking, can be crushed without risk of breakage to the mill. The power required to run the machine to its full capacity, is from *ten to twelve horses;* yet, its main shaft being *solid wrought-iron five inches in diameter*, it can be attached and run safely with power of twenty-five horses. It is stated by the manufacturers that the amount of work capable of being performed in a day of ten hours is, for raw bones, twenty tuns and upwards, varying with the condition of dryness; hard guanos, quartz, and other mineral substances, thirty to forty tuns; plaster, fifty or sixty tuns. The mill is especially adapted to the pulverization of the South Carolina deposit of guano; the grinding surface upon this may be run closely together, and a large proportion reduced to powder by the first process. Of this latter substance 25 tuns may be reduced in ten hours.

This mill has been secured by patents in Great Britain, France, and the United States, and is manufactured by Baugh & Sons, No. 20 South Delaware avenue, Philadelphia, Pa.

Influence of Colored Lights on Insects.

The discussion of the change produced in animal and vegetable forms by the influence of varying conditions of temperature, moisture, light, locality, etc., especially as connected with the Darwinian hypothesis, has induced a great variety of experiments, from which some interesting results have been derived. In some of these experiments, lately published, a brood of caterpillars of the tortoise-shell butterfly of Europe was divided into three lots. One third were placed in a photographic room lighted through orange colored glass, one third in a room lighted through blue glass, and the remainder kept in an ordinary cage in natural light. All were fed with their proper food, and the third lot developed into butterflies in the usual time. Those in the blue light were not healthy, a large number dying before changing; those raised in the orange light, however, were nearly as healthy as those first mentioned. The perfect insect reared in the blue light differed from the average form in being much smaller, the orange brown colors lighter, and the yellow and orange running into each other instead of remaining distinct. Those raised in the yellow light were also smaller, but the orange brown was replaced by salmon color; and the blue edges of the wings seen in the ordinary form were of a dull slate. If changes so great as these can be produced in the course of a single experiment, it is probable that a continuance of the same upon a succession of individuals will develop some striking results.

GRAND FAIR OF WESTERN TEXAS.—The Second Grand Fair of Western Texas will be held in October of the present year, commencing on Wednesday the 5th, at the Fair Grounds, near San Antonio, and will continue four days. A large list of premiums is offered, consisting of money and diplomas. Further information can be obtained of the Secretary, Mr. Robert Clark, of San Antonio.

GAS was first used for lighting streets in Birmingham, England, about the year 1816.

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Scientific American,

MUNN & COMPANY, Editors and Proprietors.

PUBLISHED WEEKLY AT
NO. 37 PARK ROW (PARK BUILDING), NEW YORK.

C. D. MUNN. S. H. WALES. A. E. BEACH.

☞ "The American News Company," Agents, 121 Nassau street, New York.

☞ "The New York News Company," 8 Spruce street.

☞ A. Asher & Co., 20 Unter den Linden, Berlin, are Agents for the German States.

☞ Messrs. Sampson, Low, Son & Marston, Crown Building 188 Fleet st. Trubner & Co., 60 Paternoster Row, and Gordon & Gotch, 121 Holborn Hill, London are the Agents to receive European subscriptions. Orders sent to them will be promptly attended to.

VOL. XXII., No. 26 . . [NEW SERIES.] . . *Twenty-fifth Year.*

NEW YORK, SATURDAY, JUNE 25, 1870.

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To Advertisers.

The circulation of the SCIENTIFIC AMERICAN is from 25,000 to 30,000 copies per week larger than any other journal of the same class in the world. Indeed, there are but few papers whose weekly circulation equals that of the SCIENTIFIC AMERICAN, which establishes the fact now generally well known, that this journal is one of the very best advertising mediums in the country.

SIX MONTHS OF PROGRESS IN MECHANICAL AND CIVIL ENGINEERING.

The close of the present volume affords a convenient opportunity to review what has been done in the mechanical world during the time of its publication. We shall find little that is new or startling in the way of discovery but that considerable work has been done, and some steady progress has been accomplished.

The department of civil engineering may boast of the active commencement of one of the greatest feats of engineering of modern times, in the building, launching, and placing of the great caisson, at the Brooklyn terminus of the East River Bridge. Descending into this vast structure, if one has sufficient physical strength to withstand the pressure, he may see a large gang of men busy as bees in a hive, laying the foundation for the enormous superstructure. Everything is progressing with that smoothness and absence of unforeseen contingencies which gives assurance of the successful completion of this great work.

The Suez Canal has been greatly improved, so that ships of the deepest draft now find no difficulty in making the passage.

The proposed Darien Canal has been made the subject of careful survey, and its possibilities and probabilities are becoming daily more determined.

A new explosive, dualin, has been added to the list of compounds employed for blasting, but its merits are still not so fully demonstrated as to secure the confidence which it perhaps deserves.

The question of street pavements has received more light from some successes, and by far more numerous failures. A new kind of pavement called Dura Pavement, from its resistance to wear, is now laid in small sections in several places, and seems to promise well. Experiments with the French asphalte, and with artificial imitations have also been made, but we think not with great success.

The preservation of brown sandstone, which has become so popular as a building material, has also been the subject of experiment; and concrete building, as well as the manufacture of artificial stone, has been slowly but surely advancing.

Our readers will recollect some editorial remarks upon the subject of "Improved Building Materials," published not long since in this journal. The subject will bear further attention in connection with recent improvements.

There seems to be a general effort now making to produce cheaper and if possible better building materials than have hitherto been employed. Our exchanges from abroad, more especially those devoted to architectural topics, give us very encouraging accounts of the progress of concrete building. This style of building seems growing in favor, and is furnishing a very good class of dwellings at a very cheap rate.

We find also an account of a new kind of artificial stone, called the Victoria stone, which seems to have endured severe tests and to promise well.

It is the invention of a clergyman, Rev. H. Highton. The process by which it is made consists in mixing broken granite with hydraulic cement, and steeping the whole when set in a solution of silica. The granite used is the refuse of the quarries, and is broken up at the works. It is then mixed with Portland cement, in proportions of four of granite to one of cement, sufficient water being added to give it a pasty consistency. In this state it is placed in molds, when it consolidates in about four days. When taken from the molds it is placed for two days in a solution of silicate of soda, which completes the process.

The silicate solution is prepared in a peculiar manner, and upon it the success of the operation depends. The silicate of soda has the property of hardening any kind of concrete in which lime is a component. This substance has been hitherto too costly for general use in artificial stone manufacture, and it becomes caustic by the absorption of its silica, so that it attacks the hands of the workmen.

Mr. Highton produces his solution in the following manner. He uses a soft kind of stone containing twenty-five per cent of silica, found at Farnham, in Surrey, England. This stone readily dissolves in a cold caustic soda solution.

The solution of soda is placed in the tanks used for steeping the stone, and the Farnham stone is ground and added to the bath. The lime in the artificial blocks removes the silica from the solution, which in its turn takes up more silica from the Farnham stone, and so maintains its supply of silica, thus removing the objections above named. The process is extremely ingenious, and we are informed that flagging, sinks, mantels, coping, cap-stones, sills, etc., are produced by it. Finely cut moldings are not successfully produced, and it seems better adapted to a heavier class of work.

In America also considerable improvement is observable in this field. We recently noticed an excellent stone manufactured in this city. A Brooklyn paper states that porcelain enameled bricks are now produced by a firm in that city, of great beauty, both for outside and inside work, and a cost not exceeding that of Philadelphia pressed bricks.

The adaptability of zinc for certain architectural purposes is also attracting attention, and is growing in favor. It is formed by pressure into ornaments both for outside and inside decoration, which when painted resemble, very closely, cut stone or stucco, as the case may be. These ornaments are both cheap and durable.

The Pneumatic Tunnel under Broadway, New York, has been commenced, and so skillfully conducted as not to disturb surface travel in the least. This tunnel when completed and put in operation will be the largest work of the kind in existence.

Prof. Norton, of New Haven, has been testing the hitherto admitted laws of the deflection of beams, by rigid experiment, with results varying from the hitherto accepted formulæ. His experiments, of which a notice appeared on page 256, current volume, are worthy of the attention of engineers, as the laws in question lie at the very root of scientific construction.

In rock-drilling machines, some improvement has been made, but the progress in this portion of the engineering field has been limited mostly to the more general adoption of machines already invented, than to the invention of new machines. Power is gradually superseding hand labor here, and is probably destined to be ultimately used in all extensive works where such drilling is required.

A submarine blast of unprecedented magnitude was fired in the harbor of San Francisco, on the 23d of April, by which Blossom Rock, a dangerous obstruction to commerce, was entirely removed. The rock known as Hell-gate in the East River still remains an obstruction, but it is stated that a large quantity has been removed by drilling and blasting. Our opinion is that unless some other means than are at present applied to its removal are adopted, it will be a long time ere this obstinate rock will be subdued.

In steam engineering no marked advancement has been made, although many devices tending to increased safety in the use of boilers have made their appearance. The past six months have been extremely fruitful of disasters from explosions, which shows that practice in boiler making, or in boiler tending, or perhaps both, are retrograding rather than advancing.

In miscellaneous inventions there has been considerable activity, and many useful devices have been brought to public notice. It shall be our aim in the coming volume to keep pace with all new improvements, and to render the SCIENTIFIC AMERICAN in the future, as it has been in the past, the best and most reliable record of progress published in this country.

THE CLOSE OF VOLUME XXII.

In closing the present volume we feel a natural pride in the fact that notwithstanding a host of competitors have sprung up in the various cities of the Union directly or indirectly calculated to obtain a share of the patronage of the class of readers for whose interest and instruction we have so long labored, we find our subscription list larger than ever before at this season of the year. The general tone of our correspondence also assures us that never before has the SCIENTIFIC AMERICAN held so high a place in the esteem of the reading public as at this moment.

We feel that we may entertain a just pride also in the very large variety of original matter contained in the present volume. No technical paper published in the English language has touched upon such a wide range of topics, or given information in a more popular and readable form. While then we look upon our extending circulation with satisfaction, we feel that our success is but the reward of earnest endeavor and unremitting labor to perform all that we promised in our prospectus at the beginning of the year.

We feel that our full performance of our promises to our readers also entitles us to confidently solicit their co-operation in further extending our circulation. There can be no investment for which a greater return is sure to be obtained than a subscription to this journal. Nothing comparable to it in size or in fulness of valuable contents is published for anything like its price, and its information is always gathered from reliable sources. We hope, therefore, our readers will feel like giving a good word to their friends and neighbors in our behalf, and that they will feel certain of their reward for this slight trouble in our continual effort to place weekly in their homes the most readable, instructive, and reliable paper published in the world, upon such matters of general, technical, and current interest, as comes within our sphere.

To our numerous exchanges we extend thanks for the many courtesies for which we are indebted to them, and the many favorable notices and compliments by way of copied and accredited articles, we have received at their hands.

Pledging ourselves that we shall in no way slacken our efforts to keep full pace with the advancement of the age, we shall commence Volume XXIII. with the determination that although others may compete with, they shall not excel us.

DANGER OF EXPLOSION AND COLLAPSE IN KITCHEN BOILERS---HOW TO AVOID IT.

Whether from the better construction, and more scientific arrangement of kitchen boilers in this country, or whether because cases of such explosion are not deemed sufficiently sensational to be generally reported on this side of the Atlantic, certain it is that we read of three such accidents in foreign journals, to every one that we find reported in our American exchanges. Yet there is no nation in the world that makes such an extensive use of modern improvements of this class as the American.

Such accidents, however, do happen here, and that they do not happen more frequently is certainly not due to want of facilities afforded by plumbers.

For the most part the pipes and boilers in dwellings are left in charge of servant girls, who know very little about steam or hydraulics, and many of these arrangements are constructed on principles to understand which requires not a small degree of such knowledge.

In his absence one day, notification was given to people at the residence of the writer, that the water was about to be turned off from the street, by a contractor, and directions were left to extinguish the fire, which, it was stated, would prevent any injury to pipes or boiler. Relying upon this instruction, they succeeded admirably in doing two very disagreeable things, namely, substituting a cold lunch for the usual dinner at 6 P. M., and collapsing the kitchen boiler into the shape of a very dilapidated hat just rescued from beneath the foot of an elephant.

Shortly afterwards this boiler, which had been re-rolled and repaired, was collapsed in another way. Too great heat had generated so much steam that the water was forced entirely out of the boiler. The servant, slightly opening the faucet, was alarmed at the volume of steam which escaped, and shut off the flow; this threw a jet of water in from the supply pipe, which suddenly condensed the steam, and before water in sufficient quantity could flow in to supply its place, the boiler was again suddenly flattened out.

These are the most common ways in which such boilers are collapsed, where the supply of water flows in directly from the main, as is usually the case in this country. The rarity of bursting is probably due to the fact that the head of the water limits the pressure of the steam, and the boilers are originally made to safely withstand the pressure due to the head.

We know, however, of cases where the lead pipes leading to the boilers have burst by the action of steam forcing hot water back into them and thus weakening their tenacity.

These accidents may be avoided by a proper arrangement of valves. Every boiler of this kind should have a valve opening inward to prevent collapse. It should be made strong enough to withstand considerably greater pressure than it will be subjected to by virtue of the head. Then if a check-valve be employed to keep the water from being forced back into the pipes by the steam pressure, and a safety valve be set to blow off at, say, five pounds above the maximum pressure due to the head, the boiler can neither burst nor collapse under any circumstances, and will need no care to guard it against the ignorance of servants.

THE DAWN OF AN IMPORTANT INDUSTRY.

In the year 1832, Professor Dumas, the eminent French chemist, discovered among the products of the distillation of coal a new body, to which he gave the name of paranaphthaline, but which was afterwards called anthracene. When coal tar is subjected to fractional distillation a heavy oily matter comes over, which, upon exposure to a temperature of 18° Fah., deposits crystals of naphthaline and anthracene. The crude material is treated with alcohol, which dissolves the naphthaline and leaves the anthracene unattacked. The latter body can then be purified by further distillation.

Anthracene boils at 350° Fah., and is soluble in turpentine, but not in alcohol. It does not seem to be formed at low temperatures, but at the heat required to manufacture gas it sometimes comes off in sufficient quantity to make its appearance like snow in the purifiers, and also in clogging the pipes. It is therefore as an incidental product of the gas house that we are to look for this substance side by side with the benzole, carbolic acid, and lubricating oils now so extensively made from tar.

Berthelot and Limpricht have succeeded in making anthracene artificially, but the process is too complicated for practice on a large scale, unless materially modified by further experience. It is not many years since coal tar was thrown away. The gas companies allowed anyone to take it who

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could make any use of it—finally they sold it for a trifle, and thus the case stood when the discovery of aniline produced a revolution in the whole business; and other inventions following upon its track have raised the price of coal tar so materially that the time appears to be near at hand when it would pay to make it as a direct product, and to regard the manufacture of gas as incidental.

The anthracene discovered by Dumas forty years ago has been entirely lost to view, and none but scientific men were aware of its existence, but in the light of modern research it appears likely to occupy the front rank of coal tar products, and to lay the foundation of an industry that is destined to work a revolution in the whole business of the manufacture of colors, and to restore vast provinces of the richest lands to the production of corn and grain.

At the meeting of the Lyceum of Natural History on Monday evening, Dr. Walz, a distinguished young chemist of New York, read a paper on the artificial preparation of alizarine from anthracene. He gave a history of the researches that preceded the important discovery, and in a lucid manner explained to the association the transformations that had to be made before success attended the labors of the chemists who had undertaken the research.

It will be remembered that a dispute in the French Academy as to the medical properties of the red oxide of mercury, and of the red precipitate led to an invitation being extended to Priestley to come to Paris to settle the difficulty, and he, in the course of investigation, made the important discovery of oxygen gas. In a perfectly analogous way, said Dr. Walz, have we attained our knowledge of alizarine and its artificial preparation.

Alizarine is the coloring matter of madder, and, since the time of its discovery in 1831, its true chemical composition and the proper formula to express its nature have been matters of controversy among chemists. It was while carrying on researches to settle this vexed question that the discovery was made of its possible preparation from anthracene, and thus a dispute about a chemical formula has lead to one of the grandest and most important discoveries of our time.

Messrs. Graebe and Liebermann are the chemists who have patented the process for the artificial preparation of alizarine. They prepare bibromide and bichloride of anthrachinone, and from this make the alizarine by the action of caustic alkalies. They have since found that sulphuric acid can be substituted for the bromine and chlorine.

Dr. Walz exhibited specimens of the new coloring matter as well of pieces of goods that had been dyed with it. The colors were in no way inferior to the best aniline pigments with the great advantage of being more permanent. The problem of the economical manufacture of alizarine has not been fully solved, but enough difficulties have been overcome to insure ultimate success. Thus one by one the old pigments prepared from vegetable sources have given way to the artificial colors of the synthetical chemist. Madder and indigo were the only two left, and now indigo is in undisputed, solitary possession of the field.

When the discovery of bleaching powders released thousands of acres of rich meadow land to the plow, and the culture of grain, and thus cheapened the price of clothing and of food, a great blessing was conferred upon mankind.

If all the anticipations in reference to the artificial production of alizarine are accomplished we may predict an equal advantage to be derived from this new industry.

According to a large number of experiments 100 tuns of coal tar can furnish 0·63 tun of anthracene, or we can obtain a tun of anthracene by distilling 2,000 tuns of oil—the amount of alizarine that can be made from a tun of anthracene has not been published nor is it easy to ascertain, but these figures will be supplied before the lapse of many months. The annual production of madder is estimated at 47,500 tuns, and the price per tun is £45, which makes the cost, per annum, £2,137,500.

To divert an industry of this magnitude into new channels is one of the most momentous results of modern science, and one that can only be compared in importance to the revolution accomplished by the introduction of aniline colors.

CIVILIZATION VERSUS NATURE.

There are two sets of public teachers who are very fond of referring to nature in their discourse, the one in deprecation, the other in praise. They are the theologians and the quack doctors of medicine, who publish pamphlets for popular rather than professional circulation, the aim of which is to instruct people that some proprietary nostrum which they manufacture and vend is the great panacea for the physical ills of mankind.

The first class of teachers, whose pupils are many, chiefly discourse about the moral nature of man, which they mostly unite to condemn for its asserted total depravity. The second class, whose pupils we are sorry to say, are also numerous, discourse upon man's physical nature which they unite in praising, denouncing moreover any departures from nature as fatal to physical health, and a mistake, the consequences of which they are however very careful to tell us we may escape if we will only use a few bottles of their "Great Oriental Liver Arouser," or a dozen boxes, more or less, of their "Wonderful Health Preserving Purgative Pills."

The truth about our moral and physical nature probably lies between these extreme doctrines. Our moral nature is not so totally depraved that it not susceptible of some improvement, else the preacher of the gospel would find his occupation gone. Our bodies are probably in better condition for some departures from primitive modes of living, which is what is meant by departure from nature by those who would have us eat bread made of unbolted flour, and stop our tea, coffee, condiments, and cigars. Not that we are the better for these things, but the fact that they are not natural or primitive articles of diet does not *prove* them harmful.

Civilization is a direct departure from nature. In a state of nature the weaker are sacrificed to the stronger. Life and property are at the mercy of whoever has the might to appropriate the one or destroy the other. The primitive food is not as good as the food of civilized races, and the clothing and shelter of barbarous tribes are infinitely inferior to those of enlightened races, notwithstanding the many fashionable follies in dress current among the latter. Tight shoes produce corns, but the sandal of the oriental barbarian, or the buckskin moccasin of the American Indian would result in worse diseases were they to be adopted by us. Corsets are, in our opinion, health-destroying distorters of the human form; but they do less harm than would the entire absence of dress to protect the chest, which is the custom in many savage tribes.

In becoming civilized, man's physical condition has become better, notwithstanding his departures from his earlier habits. The dog which has been taught that not to molest sheep, or disturb the chickens, are virtues which admit him to good society, or that the poodle, twenty times as small as himself, has recognized social rights which he is bound to respect, has become partially civilized. By nature dogs disregard the rights of sheep, chickens, and their fellow dogs. They are better and happier dogs for the rudiments of conscience they have acquired, and for eating their meat cooked instead of raw, as they did in a state of nature.

The fact is that to be natural is to be barbarous in all respects, and to be civilized is to be happier than is the primitive state of mankind. To say then that to eat French rolls or drink coffee, to smoke tobacco or use alcoholic drinks, is deleterious because it is unnatural, is a palpable absurdity. The true scientific mode of investigation applies the test of experiment to these things. It says, this food, or that drink, that corset, and those tight shoes, are hurtful, because experiment has shown them to be so. Experiment has shown that dyspepsia, nervous disorder, consumption, and corns, none of which make people happy, result from these practices, and therefore we denounce them. We know that some things which are not man's natural food, and which he had to teach himself to relish (tomatoes for instance) have proved excellent articles of diet.

The scientific method teaches that man's primitive condition, or what is understood by the phrase "state of nature" is no index of his capabilities, but accurate experiment is. It says whatever is done, is done in accordance with the laws of nature, because it is impossible to defy them. All good, as well as all hurt, is simply a result of such obedience. If a man takes arsenic it is in accordance with nature that he shall suffer poisoning. If he eats wholesome food it nourishes him in accordance with the same laws by which poison kills.

People have been so long accustomed to regard systems of ethics as things settled for them, and to which the true scientific method cannot apply, that to suggest that in these fields there is yet room for experiment, or to go further and assert that nothing like well conducted organized experiment has been applied to determine what is morally good, and what is morally bad, may shock at least the conservative portion of modern society. We will not thus shock them, but will close by asking if there is ever to be such a thing as social *science*, how else is it to be obtained? Surely there cannot be a science without the pursuance of a scientific method, and the difficulty in ever applying such a method is what has led many thinkers to doubt the possibility of a social science.

INSTRUMENTS FOR SOUNDING ALARMS.

From remote times it has been found necessary to employ means whereby signals of warning could be given speedily through a long distance in times of emergency. Sometimes the event of which it was desired to communicate intelligence was war, sometimes fire, sometimes shipwreck; or it was necessary to warn vessels off from a dangerous coast.

Light traveling with inconceivable swiftness, and easily generated by the kindling of bonfires on hill-tops, is the primitive means adopted by savages to signal distant tribes or clans. The bonfire and firebrand gradually gave way to rockets and colored fires, and the modern light-house with French lenses, electric lights, and the various contrivances which characterize the modern system of beacons.

But the use of artificial light is limited by distance and the state of the atmosphere, and it is only seen by those who are awake.

As civilization advanced another sense was resorted to, that of hearing, which is easily aroused to action when people are wrapped in slumber. The principal device known to early civilization for sounding alarms was the bell, which to the present time, is still universally employed by civilized races.

Next followed the discharge of cannon, the sound of which travels much farther than that of the bell. The employment of steam has given birth to another class of alarm instruments, comprising steam whistles, gongs, and fog-horns, which emit sounds of immense volume and great penetrating power.

Last and most wonderful in its far-reaching, subtile power, is the telegraph wire, which penetrates the darkness even of the ocean deeps, and whose action is so delicate that a pulse-beat in London may be registered in New York.

It might be supposed that in this triumph of science invention in this field had culminated and every possible means attainable by man is reached, whereby he can convey intelligence to remote points.

The telegraph has shown that the senses of sight and hearing are not all we possess by which the knowledge of distant objects and events become possible. A blind and deaf man might easily be taught to read and communicate telegraphic messages through the sense of touch. It is obvious, however, that this sense cannot be made available for purposes of general signaling, or, even if it could, that the senses of sight and hearing are far more available.

The telegraph is necessarily limited in its application so long as a wire is necessitated to convey the electric current, and although from time to time it has been announced that somebody had discovered, or was about to perfect a discovery of a method whereby the metallic conductor might be abandoned for the universal substances, earth, air, and water, these announcements have not borne fruit, and we think the prospects of such a discovery are not encouraging.

In a recent conversation with a gentleman of some inventive genius, he made a suggestion, of a method for transmitting sounds to vessels at sea, something similar to which we seem to have heard or read of before, but which we cannot refer to any particular source. It however seems that some experiment in the direction indicated might lead to good results.

The main feature of the plan is to make the water instead of the air the medium through which the sound is to be conveyed to the vessel. To this end he suggested that each vessel should be provided with a funnel, the bell of which should be inverted in the water at some convenient position upon the ship, forming a very large hearing trumpet to collect the sound transmitted through the water, and concentrate it in the ear of a person stationed to detect the signals.

To generate a sound of great intensity, he suggests that a bell or fog-horn, or perhaps even a cannon, be placed in a submerged apartment, the air in which is submitted to the pressure of the superincumbent water. At a depth of ninety feet the air would be compressed by a weight of nearly four atmospheres, and the intensity of the sound produced would be greatly increased thereby, and would therefore be transmitted with greater velocity and to a greater distance through the water than in air.

Tyndall states in his treatise on sound that its intensity depends upon the density of the air in which it is generated, and not upon the density of the air in which it is heard, therefore the inferior density of the air in the "Dionysian ear" attached to the vessel would not affect the transmission. It is thought that vessels might be signaled at a distance of thirty miles in this way, and we think it not impossible that such a result might be attained.

ST. ANTHONY'S NOSE AND THE MANUFACTURE OF SULPHURIC ACID.

It appears that a portion of the rocks on the Hudson river named in honor of one of the best saints in the calendar, abounds in sulphurous pyrites, and that the manufacturers of oil of vitriol are fast blowing off St. Anthony's nose, so that soon nothing will be left but the name.

The cliff at this point contains large deposits of pyrites, and recently extensive sulphuric acid works have been erected on an island in the river, the sulphur for which is obtained by roasting the ore on the spot.

Hitherto all of the sulphur for acid works was imported from Sicily. In England they have long been in the habit of making sulphur from their own ores, and have thus effected a great saving in various ways; first, in the cost of the sulphur, and, secondly, in the reclamation of copper from ores that would otherwise have been worthless. They also manufacture large quantities of red paint out of the iron pyrites, and sometimes smelt the oxide to iron. The fact that it is found to pay to take the factory to the mines of sulphur, leads us to hope that eventually the auriferous copper and iron ores of Colorado can be advantageously worked in this way, thus furnishing us sulphuric acid for a large number of industries, while the whole of the copper and gold can be obtained. This solution of the difficult question of how best to work these ores would no doubt be the most practical of any, and would do away with the disagreeable and expensive system of amalgamation hitherto practiced.

We need sulphuric acid works all over the country to enable us to manufacture our own soda ash, and for refining petroleum and converting the phosphates of Crown Point and South Carolina into super-phosphates for our land.

EXTENSION OF A SEWING MACHINE PATENT.

On the 8th of May, 1849, a patent was issued to John Bachelder for an improvement in sewing machines. The claim covers an endless cloth holder in combination with a device for discharging the cloth after being sewed. This patent in due course of time became the property of the Sewing Machine combination, and was extended by the Commissioner of Patents for seven years from May 8, 1863, and now by the expiry of the patent, the invention has become the property of the public. We understand that an application is now pending before Congress for another extension of the Bachelder patent, and that strong efforts are making to secure favorable action upon the petition. It does not appear that any protest has been filed against the extension, and it is possible that the Committees on Patents may be persuaded to consider the case as one of great merit; but we can assure the Committees that the public feels a deep interest in the matter, and will not sanction the extension of this or any other patent for the exclusive benefit of a giant monopoly such as now controls the entire sewing machine interest of this country.

M. DIDIERJEAN read a note at a recent meeting of the Academy of Sciences, calling attention to the fact that milk is a preservative from the poisonous effects produced by lead upon the workmen who are engaged in the preparation of its compounds.

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Facts for the Ladies.

I have used Wheeler & Wilson's Sewing Machine for the past six years, and it has, in all respects, surpassed my highest expectations. During this time, though I have done all my family sewing upon it, it has not needed the slightest repair, and I am still using the needles I got with the machine, never having either broken or bent one.

MRS. S. W. BURCKETT.

No. 3 Seventh ave., Brooklyn.

Business and Personal.

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The paper that meets the eye of manufacturers throughout the United States—Boston Bulletin, $4·00 a year. Advertisements 17c. a line.

For Sale—An engine, 7x11, to be sold to put larger one in its place. Apply at 411 West 50th st.

First-class Locomotive Boiler, twenty flues, 1-2-in. diam., 9-in. long. Price $25. E. P. Watson, Box 4436, New York.

Direct-acting Steam Circular Saw Mill—Mill and engine combined in one machine. The power of the engine applied directly to the saw without belts. They are now in successful operation. Patent applied for. E. H. Bellows, Worcester, Mass.

The "Union Water Meter Co.," Worcester, Mass., Manufacture Steam-pressure Regulators, the best machine in use for reducing and regulating the pressure on paper machines, bleacheries, slushers, and all places where an even temperature is desired.

For foot-power engine lathes address Bradner & Co., Newark, N.J.

Lithograph Press, Stone, etc., for sale, $10. 16 Beach st.

Lubricators and Oil Cups for shafting and machinery. Broughton's are the best. Manufactured only by H. Moore, 41 Center st.

Wanted—A good second-hand molding or sticking machine, medium size. Milton Bradley & Co., Springfield, Mass.

Rawhide Carriage Washers are cheaper than leather, and run with less noise than any other. Darrow Manufacturing Co., Bristol, Conn.

Dickinson's Patent Shaped Carbon Points and adjustable holder for dressing emery wheels, grindstones, etc. See Scientific American, July 24th, and Nov. 20, 1869. 61 Nassau st., New York.

Peck's patent drop press. Milo Peck & Co., New Haven, Ct.

Catlin's Patent Self-closing Barrel Filler for filling packages with liquids of any kind. See other advertisement, and address, for circular, S. C. Catlin, Cleveland, Ohio.

Machinists and others using Fine Tools, send for illustrated catalogue. Goodnow & Wightman, 23 Cornhill, Boston.

Pictures for the Sitting Room.—Prang's latest Chromos, "Flowers of Hope," and "Flowers of Memory." Sold in all Art and Book Stores throughout the world.

Tempered Steel Spiral Springs for machinists and manufacturers. John Chatillon, 91 and 93 Cliff st., New York.

Shop, Town, County, or State Rights for sale, for Patent Coal Scuttle. For circular, etc., address T. T. Markland, Jr., 1515 South st., Philadelphia, Pa.

L. L. Smith, 6 Howard st., N. Y., Nickel Plater. First Premium awarded at the late Fair of the American Institute. Licenses granted by the United Co., 17 Warren st., New York.

One 60-Horse Locomotive Boiler, used 5 mos., $1,200. Machinery from two 500-tun propellers, and two Martin boilers very low. Wm. D. Andrews & Bro., 414 Water st., New York.

Kidder's Pastilles.—A sure relief for Asthma. Price 40 cents by mail. Stowell & Co., Charlestown, Mass.

Pat. paper for buildings, inside & out, C. J. Fay, Camden, N. J.

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Glynn's Anti-Incrustator for Steam Boiler—The only reliable preventative. No foaming, and does not attack metals of boiler. Liberal terms to Agents. C. D. Fredricks, 587 Broadway, New York.

To ascertain where there will be a demand for new machinery or manufacturers' supplies read Boston Commercial Bulletin's manufacturing news of the United States. Terms $4·00 a year.

Cold Rolled—Shafting, piston rods, pump rods, Collins pat. double compression couplings, manufactured by Jones & Laughlins, Pittsburgh, Pa.

For mining, wrecking, pumping, drainage, and irrigating machinery, see advertisement of Andrews' Patents in another column.

Caldwell's Dryer dries Brick, Fire Brick, Tile, Peat, Whiting, etc., as fast as made. J. K. Caldwell & Co., Philadelphia.

Winans' boiler powder, 11 Wall st., N. Y., removes Incrustations without injury or foaming 12 years in use. Beware of Imitations.

Recent American and Foreign Patents.

Under this heading we shall publish weekly notes of some of the more prominent home and foreign patents.

CLAMPING MACHINE.—James H. Humes, East Saginaw, Mich.—This invention relates to improvements in machines for clamping sash and other like frames of wood, for squaring them up and holding them for fastening, and it consists in an arrangement on a table having a strong frame around the edge and raised above it, of two sliding clamping bars at right angles to each other, on horizontal slides working in slots in the table top, by means of cranked shafts below operated by treadles or hand levers, to which slides the bars are adjustably connected by angle plates, to be changed for larger or smaller frames, and which have set screws for adjusting the clamping bars to the shape of the frames to be clamped.

PROJECTILE FOR RIFLED CANNON.—John G. Butler, Fort Leavenworth Kansas.—This invention relates to an improvement in lifting studs applied to projectiles for the purpose of centering the front ends of the same, and the invention consists in the combination with a projectile of a band and studs, both expansible and respectively fitted in undercut cavities at the front and rear ends of a projectile.

LEMON SQUEEZER.—James L. Jensen, Brooklyn, N. Y.—This invention relates to improvements in lemon squeezers, and consists in an improved means of attaching the porcelain cups or bowls to the handles.

BEDSTEAD.—James C. Merritt, West Point, N. Y.—This invention consists in so constructing the parts and rails of a bedstead that they may be securely and durably fastened together without screws or metal fastening of any description, and a strong and perfect bedstead formed thereby.

BRIDLE BIT.—M. J. Firey, Mansfield, Ohio.—This invention relates to a new and useful improvement in bridle bits, whereby they are made more effective in securing horses to posts or other fixtures, than bridle bits have heretofore been.

STEAM BOILER BLOW-OFF PIPE.—John C. McLaughlin, Pittsburgh, Pa.—The object of this invention is to provide efficient means for clearing the bottoms, or interior lower surfaces of steam boilers of scale and sediment, thereby preventing such boilers from being damaged by the fire.

PERCOLATOR.—Albert Merrell, Cincinnati, Ohio.—The object of this invention is to furnish an apparatus by means of which percolation can be forced, either by removing the pressure of the atmosphere by vacuum from the bottom of the percolator, or by forcing air into it at the top, or both, and thereby greatly accelerating and more perfectly performing the operation known in pharmacy as percolation.

COMBINED IRON AND STEEL BARS.—Ellridge Wheeler, Hudson, Mass.—This invention relates to improvements in the manufacture of metal bars, having for its object to provide merchantable bars of combined iron and steel, of any size, shape, and length, the two metals being permanently welded and adapted for working by the common methods into any required articles.

ELEVATING APPARATUS.—P. R. Berry, Youngstown, Ohio.—This invention relates to improvements in apparatus for elevating brick, mortar, and other building material in the erection of buildings, and consists in a platform, sectional vertical guides, and a safety holding apparatus for the platform, arranged for hoisting the material either by manual labor or by horse or steam power in a rapid and economical manner.

VEGETABLE CUTTER, SCRAPER, ETC.—A. W. Pagett, Springfield, Ohio.—This invention relates to improvements in machines for washing, cutting, pressing, and scraping vegetables for food, fruit for making cider, wine, etc., and for crushing beefsteak, stuffing sacks for sausages, and other like uses. The invention consists in a peculiar construction and arrangement in one machine, of a washing apparatus, a pressing apparatus for separating the juice from the pomace, also applicable for stuffing, a cutting, and a scraping apparatus, under an arrangement whereby all the operating parts may be worked by one hand lever, and whereby the same may be simply and cheaply constructed.

RAILROAD RAILS.—Ellridge Wheeler, Hudson, Mass.—This invention relates to improvements in railroad rails, and consists in the construction of rails, either of iron and steel, or all iron, so that the whole of the exterior shell, or the whole of the same except the base will be formed of homogeneous steel or iron, and welded to the central iron part with no seams or "lines of filing" extending to the surface, except at the edges of the base, and so that more perfect welds will be formed between the steel and iron.

RATTAN CUTTER FOR UMBRELLA RIBS.—John Murphy, Green Point, N. Y.—This invention has for its object to construct a tool by means of which rattan can be cut on three sides for umbrella ribs, and the outer separated parts split, to be useful for caning chairs. The invention consists in the construction of a cutter, having three cutting sides, and open on the fourth side, and provided with outward projecting splitting ribs.

WASHING MACHINE.—Israel Baker, Tomah, Wis.—This invention has for its object to furnish an improved washing machine, which shall be simple in construction, and effective in operation, and which may be manufactured and sold for a small amount.

WASHING MACHINE.—Gustavus Hamel, De Soto, Mo.—This invention has for its object to furnish an improved washing machine, simple in construction, easily operated, and effective in operation, washing small and large articles with equal facility and thoroughness.

POTATO DIGGER.—Daniel Bibbee, and William Rand, Letart Falls, Ohio.—This invention has for its object to furnish an improved potato digger, which shall be so constructed as to raise the potatoes and soil, and separate the potatoes from the soil and from the weeds and grass that may be raised with them, and deposit the potatoes in a box, and which shall at the same time be simple in construction and operation.

WATCHES.—Henry Stauffer, Ponts Martel, Switzerland.—This invention relates to improvements in watches, and consists in an arrangement of the large second hand, commonly called "dead second," to beat full seconds at one beat, instead of making several beats to a second as they now do. It also consists in arranging it to beat in unison with the quarter second, the same being connected together by gearing arranged in a novel manner.

HORSESHOE.—S. J. Baker, Madison Centre, Me.—This invention relates to improvements in horseshoes, for spreading the heels of horses, that have become too contracted, and it consists in jointing the two parts of the shoe at the front to a plate to which the toe calk is attached by a rivet through each part, and a central rivet at the space between the ends of the two parts, the latter to prevent the two parts from shifting forward or back. It also consists in beveling the rear parts of the shoe from the inside outward and downward, so that the walls of the heel fitted thereon will be gently forced outward; and it also consists in the application to the said rear parts, of a spreading seam, for gradually setting the parts outward from time to time when the shoe is attached to the foot, to spread the heel.

MACHINE FOR MAKING HARROW TEETH.—James Morgan, Pittsburgh, Pa. This invention relates to improvements in machines for making harrow teeth, and consists in an arrangement of a pair of pressing and pointing dies, a fine cutter, and a cutter for cutting off the bar.

SCREENS.—W. C. Chapman, Charleston, S. C.—This invention relates to improvements in the construction of rotary, reciprocating, or other screens or sieves for screening rice and other grains, and consists in making screens with meshes in the form of oblong parallelograms, of round or other oval formed wire, preferably wound (in the case of circular screens) spirally over the transverse ribs, widely separated, and confined to them by small wires wound around each, determining the width of the spaces between the wires; and in the case of flat screens, stretched across the transverse wires and similarly secured, or in some cases stretched from end to end of the rotary screen, the transverse ribs being arranged the other way, but not spirally.

COTTON SEED PLANTER.—Edward J. Hudson, Golconda, Ill.—This invention has for its object to sow two "stands" of cotton seed at one and the same time, one of which shall be covered deeply, and the other shallow, in order that, if the weather be wet the shallow-covered seed may germinate, and if the weather be dry the deeply covered seed may come up, and the farmer thus be reasonably sure of a crop in either alternative.

TOY HOOP.—Philipp Hessemer, Washington, D.C.—This invention consists in the combination of tags painted in different colors with the spokes of a hoop, one tag to each spoke, and in the arrangement of one tag near or next to the hub of the hoop, the second tag at a distance from the hub greater than the length of the first, and the third tag at a distance from the hub greater than twice the length of the first, and so on, in order that, when the hoop is rapidly revolved, it may show as many separate concentric colored rings as there are tags.

RAILWAY GATE.—John B. Rittenhouse and Jos. Collins, Locust Lane, Pa.—This invention has for its object to enable a locomotive engine to automatically open the gates placed across a railway track for the purpose of preventing cattle from straying thereon to places whither they should not wander.

NET WEIGHT SPRING BALANCE.—John Jochum, Brooklyn, N. Y.—This invention relates to improvements in spring balances, whether having circular dials or straight scales, over which the index fingers work, and consists in the application of an adjustable pointer or index finger arranged to be set back to zero after the "tare" has been placed on the scale, and indicate the net weight only of the article placed on the vessel for containing it; or in case the dial or scale be arranged to move past a fixed finger, the said dials or scales are to be similarly adjustable.

STRAW CUTTER.—Nelson O'Neil, Purchase Line, Pa.—The object of this invention is to furnish a machine for cutting straw and similar material for feed, which machine shall be cheap, durable, and convenient, and it consists in the arrangement for changing or varying the length of the feed cut.

METALLIC CONNECTIONS FOR MOSQUITO-NET FRAMES.—U. W. Armstrong and Ira Keeney, Evansville, Ind.—This invention has for its object to furnish improved metallic connections for securing the upright and horizontal bars of mosquito-net frames to each other, which said connections shall be simple in construction and effective in operation, enabling the net frames to be readily put up and taken down when required.

BRIDLE BIT.—Milton J. Firey, Mansfield, Ohio.—The object of this invention is to provide suitable and efficient means for securing and controlling horses, more especially designed for vicious and headstrong horses which cannot be controlled by the ordinary bit, or which have a habit of pulling and breaking away when hitched.

PROCESS OF CLEANING AND POLISHING COFFEE BEANS.—Charles C. Warren and James B. Baldy, Toledo, Ohio.—This invention has for its object to simplify the process of cleaning and polishing raw—that is, not roasted—coffee beans, and to prevent the application of foreign substances to the beans during such cleaning process.

CRANK MOTIONS FOR ENGINES.—John Smith and Godfrey Joithe, New ark, N. J.—This invention relates to certain improvements in that kind of crank motion in which, by the application of two gear wheels the motion of the crank shaft is doubled. The invention consists in mounting the crank upon a sleeve which turns loose on the crank, and which carries a cam for setting the valve. The sleeve, cam, and crank make but one revolution to two of the shaft, and the valve is therefore set to produce one revolution of the crank whose shaft meanwhile turns twice.

STEAM GENERATOR.—T. S. La France, Elmira, N. Y.—This invention relates to a new vertical steam generator, which is so constructed that the heat of the fire is almost entirely utilized, and that steam can be very rapidly produced. The invention consists in a new arrangement of double pipes which lead from the main water chamber into the fire-box, and in which a complete circulation of the water will be obtained to create steam rapidly. The invention also consists in the use of a novel super heater.

ADJUSTABLE SHEDS AND ROOFS.—Francis L. Hall, Oneida, N. Y.—This invention relates to a new manner of hanging the protecting leaves of field and garden sheds, and the roofs of equivalent structures, with a view of allowing their adjustment in every direction for letting the rays of light pass through from either side.

HEATER.—John F. Still, West Farms, N. Y.—This invention relates to improvements in heaters, for heating dwellings and the like, by means of cold air received into a space between the shell of the combustion chamber and an outer shell, to be heated and then conveyed to the room to be heated and it consists in an arrangement, in the said space, of heating plates, draft-regulating heaters, and a water reservoir, whereby the air is heated and mixed with the vapor rising from water contained in the said reservoir, in any efficient manner, the said arrangement being such that the heater may be very cheaply constructed.

PRESS FOR COTTON AND OTHER SUBSTANCES.—W. I. Blackman, Columbus, Miss.—This invention has for its object to furnish an improved press for compressing bales of cotton, and other substances, which shall be strong, durable, simple in construction, effective in operation, and may be built at a trifling expense.

SCREENS, GRATINGS, ETC.—Charles Lockwood, Haverstraw, N. Y.—This invention has for its object to improve the construction of the metallic part of the screen or grating, and the manner of its attachment to the frame to adapt it for use for sand and coal screens, ash sieves, door and window gratings, wool-washing machine gratings, and similar purposes.

CHURN DASHER.—Philip Edgerton, Rutland, Vt.—This invention has for its object to furnish an improved churn dasher which shall be so constructed and arranged as to throw the milk into various currents and counter currents, thereby violently agitating it, bringing the butter in a very short time, and developing all the butter that may be in the milk.

STOVE FOR HEATING PURPOSES.—Dewitt C. Clark and Henry W. Cady, Sioux City, Iowa.—This invention relates to a new and useful improvement in stoves, for heating purposes, whereby such stoves are rendered more efficient for the purpose intended than stoves of ordinary construction, and it consists in forming chambers between the outer wall or casing of the stove, and in a damper in the lining, and in a dividing partition.

ANIMAL TRAP.—William D. Lindsley, Eudora, Kansas.—This invention relates to a new and useful improvement in traps for catching rats and mice, and other animals, and consists in making the trap in two compartments, and so arranging the mechanism, that the animal springs the trap in one compartment, and is caught, and, in attempting to escape by passing into the other compartment, he resets the trap.

STYLUS FOR HAND WRITING.—A. S. Carleton, Providence, R. I.—The object of this invention is to provide a substitute for the ordinary writing pen whereby a constant supply of ink may be always ready for use, and by which a light or a heavy and uniform ink mark may be made on paper; and it consists in an ink fountain tube, tapered nearly to a point at one end, and discharging the ink therefrom, the flow of ink being regulated by an adjustable needle valve, and by an adjustable air valve, or screen.

PORTABLE WRITING DESKS.—William Bothe, Williamsburgh, N. Y.—This invention has for its object to improve the construction of portable writing desks, so as to make them stronger, more durable, and less liable to get out of order.

WASHING FLUID.—John Bolinder, Brooklyn, N.Y.—This invention has for its object to furnish an improved washing fluid, or soft soap, which will readily and thoroughly remove dirt and grease, will bleach the clothes, and will not injure the fabric.

MUSICAL STAFF.—Horton Wright, Akron, Ohio.—This invention has for its object, and consists in, drawing the lines of the staff to correspond essentially with the key-board of a musical instrument, such as a piano, melodeon, etc. Or, so as to be, in fact, identical with said key-board.

AUTOMATIC LIQUID MEASURE AND FUNNEL.—Theodore W. Ellis, Macon, Ga.—This invention has for its object to furnish an improved liquid measure which shall be so constructed that exactly the desired amount of the liquid will flow out, automatically, from the measure into the receiving vessel the measure acting, at the same time, as a funnel.

SHEET METAL PIPE FORMING AND THREADING MACHINE.—M. K. Pierce Calahan's Ranch, Cal.—This invention relates to new and useful improvements in machinery for forming sheet metal pipe, and forming screw threads on them. It consists in the combination with a bed plate, having oblique grooves and ribs along each margin, of a forming roller, having spiral grooves and projections at the ends, so corresponding to those the bed that when placed thereon its projections will fit in the grooves the bed, and the projections of the latter will fit in the grooves of the former, and operating gear for pressing the roller down upon a sheet placed between it and the bed and attached to one end of the roller, and rolling the latter along the bed, to impart by the said grooves and projections spiral threads to the sheet, which is rolled up at the same time into tubular form, and forced upon punches, which are so arranged in the bed as to punch the lapping edges of the plate to form the rivet holes for connecting them.

ATTACHING SPONGE AND CHALK HOLDER.—Cornelius S. See, New Brunswick, N.J.—This invention relates to improvements in attaching sponge and chalk holders to desks, billiard, and other tables, and consists in providing slotted metal holders for the handles or shanks of the cups, for permanent attachment to the tables, and for connection of the shanks in the slots of the holders, in a way to hold them more permanently, and to prevent the holding screws from getting loose as they now do when screwing the vibrating shanks up against the wood.

GRINDING ATTACHMENT FOR CARDING MACHINES.—Andrew J. Burke, Mansfield, Ct.—This invention relates to the application to carding machines of an attachment for imparting motion to the carding cylinders in the direction opposite to their working motion—as is required for grinding the cards—by means of the main driving belt while working on the loose pulley of the main card shaft, and without the labor and delay involved the present practice of lengthening and crossing the driving belt.

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Official List of Patents.

Issued by the United States Patent Office.

FOR THE WEEK ENDING June 14, 1870.

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Patent Solicitors. No. 37 *Park Row, New York*

104,095.—HANDLE FOR CROSSCUT SAW.—Emanuel Andrews, Williamsport, Pa.
104,096.—WASHING MACHINE.—Israel Baker, Tomah, Wis.
104,097.—HORSESHOE.—Sanford J. Baker, Madison Center, Me.
104,098.—CAR COUPLING.—William Rondeau Baker, Trempealeau, Wis.
104,099.—SPARK ARRESTER. — William Ballard, Caroline, N. Y.
104,100.—BREECH-LOADING FIRE-ARM.—K. V. Barnekov, Cornwall, N. Y.
104,101.—HAWSE-PIPE STOPPER.—Orin B. Bearse, Hyannis, Mass.
104,102.—ELEVATING APPARATUS.—P. R. Berry, Youngstown, Ohio.
104,103.—PRESSES FOR COTTON, ETC.—W. I. Blackman, Columbus, Miss.
104,104.—SOFT SOAP OR WASHING FLUID.—John Bolinder, Brooklyn, N. Y.
104,105.—APPARATUS FOR FEEDING CATTLE ON RAILWAY TRUCKS.—W. J. Bonser, London, England.
104,106.—HAME-TUG FOR HAMES.—Nathan Botsford, Somerset, N. Y.
104,107.—MILLSTONE DRESS.—Daniel Bowman, Johnson City, Tenn.
104,108.—PROJECTILE FOR ORDNANCE.—J. G. Butler, Fort Leavenworth, Kansas.
104,109.—FOUNTAIN PEN.—Albert S. Carleton, Providence, R. I.
104,110.—TRUSS BRIDGE.—M. S. Cartter and H. B. Cartter, St. Louis, Mo.
104,111.—APPARATUS FOR MAKING TUBING.—James Cassidy (assignor to himself and H. K. Flagler), East Boston, Mass.
104,112.—RICE SCREENS.—William C. Chapman, Charlestown, S. C.
104,113.—SNOW PLOW.—Thomas C. Churchman, Sacramento, Cal.
104,114.—MACHINE FOR FORMING ELLIPTIC SPRINGS.—J. B. Cleveland and H. C. Guildersleive, Newark, N. J.
104,115.—OIL CUPS AND BEARINGS FOR SPINDLES.—Eugene Convers, Oswego, N. Y.
104,116.—FOLDING SCHOOL DESK.—Eugene Convers, Oswego, N. Y.
104,117.—SELF-PROTECTOR.—Daniel P. Cook, Hartford, Conn.
104,118.—BROOM AND WHISK.—E. P. Cooley, New York city. Antedated June 6, 1870.
104,119.—PULLEY.—G. B. Cowles, Bridgeport, Conn.
104,120.—BUTTER EXTRACTOR.—Thomas Curtis, Holly, Mich.
104,121.—MACHINE FOR FINISHING STAVES.—Amos Cutter, Boston, Mass. Antedated May 17, 1870.
104,122.—PAPER FILE.—Augustus Day, Detroit, Mich. Antedated May 27, 1870.
104,123.—VEGETABLE WASHER.—Richard Derham, Bermondsey, England.
104,124.—HORSE HAY FORK.—W. E. Derrick (assignor to himself and G. B. Gravison), Jordan, N. Y.
104,125.—HAIR BRUSH OR COMB.—Thomas Divine, Charleston, S. C.
104,126.—HYDROCARBON VAPOR MACHINE FOR ILLUMINATING PURPOSES.—B. B. Douglas, Newark, N. J.
104,127.—CHURN DASHER.—Philip Edgerton, Rutland, Vt.
104,128.—FAUCET.—Asa Eggleston, Fall River, Mass.
104,129.—LIQUID MEASURE.—Theodore W. Ellis, Macon, Ga.
104,130.—SEPARATING AND REFINING METALS.—C. S. Eyster, Denver, Colorado Territory.
104,131.—HORSE HAY RAKE. — William H. Fay, Camden, N. J.
104,132.—WOODBOX.—Frank Ficht, Dyckesville, Wis.
104,133.—BRIDLE BIT.—M. J. Firey, Mansfield, Ohio.
104,134.—BRIDLE BIT.—M. J. Firey, Mansfield, Ohio.
104,135.—CARRIAGE SPRING.—J. S. Foster, Salem, Mass.
104,136.—COMBINED GRATE FRONT AND OVEN.—J. W. Gillespie and Wm. Hughes, Alliance, Ohio.
104,137.—LOOM TEMPLE.—Albert H. Gilman, Boston, Mass.
104,138.—TREATING GRAIN TO OBTAIN EXTRACTIVE MATTER FOR COLORING AND FLAVORING SPIRITS.—Samuel H. Gilman, Galveston, Texas.
104,139.—LUBRICATOR.—Darwin Alanson Greene, New York city.
104,140.—SHOVEL.—G. W. Gregory, New York city.
104,141.—PORTABLE SELF-ELEVATOR.—H. L. Hall, Buffalo, N. Y.
104,142.—ADJUSTABLE SHED.—F. L. Hall, Oneida, N. Y.
104,143.—BEDSTEAD.—T. Q. Hall, Indianapolis, Ind.
104,144.—WASHING MACHINE.—Gustavus Hamel, De Soto, Mo.
104,145.—FIRE KINDLING.—J. L. Hannum and S. H. Stebbins, Berea, Ohio.
104,146.—LINIMENT.—O. P. Hare, Petersburg, Va.
104,147.—DOVETAILING MACHINE.—Elander Heath, San Francisco, Cal.
104,148.—STAMP CANCELER.—Eli E. Hendrick, Carbondale, Pa.
104,149.—CENTRIFUGAL MACHINE.—S. S. Hepworth, Cold Spring, N. Y.
104,150.—TOY HOOP.—Philipp Hessemer, Washington, D. C.
104,151.—METHOD OF MOUNTING CROQUET BOARDS.—H. R. Heyl, Philadelphia, Pa. Antedated May 30, 1870.
104,152.—PAPER-RULING MACHINE.—Wm. O. Hickok, Harrisburgh, Pa.
104,153.—DITCHING MACHINE.—M. C. Higgins and G. B. Higgins, Flemington, N. J.
104,154.—COTTON CHOPPER.—Rufus C. Holt, Morehouse Parish, La.
104,155.—STANDARD FOR DROP LIGHT.—John Horton, New York city.
104,156.—RAILWAY SWITCH.—J. R. Howell, Atlanta, Ga.
104,157.—COTTON-SEED PLANTER.—Edward J. Hudson, Golconda, Ill.
104,158.—STOVE ILLUMINATOR.—G. G. Hunt, Bristol, Ill.
104,159.—LEMON SQUEEZER.—James L. Jensen, Brooklyn, N. Y.
104,160.—SPRING SCALE.—John Jochum, Brooklyn, N. Y.
104,161.—SCHOOL FURNITURE.—J. M. Johnson, Chillicothe, Ohio.
104,162.—ROAD SCRAPER.—D. B. Jones, Wood Station, Ohio. Antedated June 3, 1870.
104,163.—NAIL FOR PICTURES, ETC.—Hubert J. Judd, Brooklyn, N. Y.
104,164.—TASSEL HOOK.—H. L. Judd, Brooklyn, N. Y.
104,165.—DIE FOR FORGING VISE BOXES.—Christian Konold, Pittsburgh, Pa.
104,166.—PLOW.—Matthew Laflin and Enos Slosson, Chicago, assignors to Matthew Laflin.
104,167.—STEAM GENERATOR. — T. S. La France, Elmira, N. Y.
104,168.—OIL PUMP.—L. S. Lapham (assignor to M. S. Brown), Providence, R. I.
104,169.—PAPER-BAG MACHINE. — Hervey Law, Chatham, N. J.
104,170.—HOBBY HORSE.—John Liming, Philadelphia, Pa.
104,171.—CARPET CLEANING MACHINE.—H. H. Lindhorst, St. Louis, Mo.
104,172.—ANIMAL TRAP. — William D. Lindsley, Eudora, Kansas.
104,173.—SCREEN.—Chas. Lockwood, Haverstraw, N. Y.
104,174.—EGG BEATER.—Thos. Marsh and Jas. Berney, Pawtucket, R. I.
104,175.—TASSEL.—C. J. McAlister, Chicago, Ill. Antedated June 9, 1870.
104,176.—SOFA AND BEDSTEAD.—Charles J. McAlister, Chicago, Ill.
104,177.—"FOUR-HIGH ROLLS" FOR ROLLING METAL.—G. F. McCleane, Pittsburgh, Pa.
104,178.—STEAM BOILER BLOW-OFF PIPE.—J. C. McLaughlin, Pittsburgh, Pa.
104,179.—CRUCIBLE STAND FOR FUSING METALS.—J. C. McManus, Providence, R. I.
104,180.—MILK COOLER.—Jas. W. McMillan, Granger, Ohio.
104,181.—PERCOLATOR FOR DRUGGISTS AND OTHERS.—Albert Merrell, Cincinnati, Ohio.
104,182.—BEDSTEAD.—J. C. Merritt, West Point, N. Y.
104,183.—DOUBLE-POINTED TACK.—Purchase Miles, New York city.
104,184.—MACHINE FOR MAKING DOUBLE-POINTED TACKS.—Purchase Miles, New York city.
104,185.—HORSE AND CATTLE POKE.—Warren Miller, Granger, Ohio.
104,186.—MACHINE FOR MAKING HARROW TEETH.—James Morgan, Pittsburgh, Pa.
104,187.—FEED-WATER HEATING APPARATUS.—J. F. Morse, Oshkosh, Wis.
104,188.—STEAM GENERATOR. — Joseph Nason and David Saunders, New York, assignors to Joseph Nason and H. R. Worthington, Irvington, N. Y.
104,189.—CHURN DASHER.—Lewis T. Newell, Geneva, Ohio. Antedated May 20, 1870.
104,190.—MANUFACTURE OF PASTE.—G. G. Noah, Boston, Mass.
104,191.—CHURN.—J. H. Ormsby and R. S. Harton, Holden, Mo.
104,192.—VEGETABLE CUTTER AND SCRAPER.—A. W. Pagett, Springfield, Ohio.
104,193.—METALLIC CAP FOR TIN CANS.—Geo. H. Perkins, Brooklyn, N. Y.
104,194.—MANUFACTURING CARRIAGE SPRING HEADS.—W. R. Petrie, Westville, Conn.
104,195.—ALARM ATTACHMENT FOR LOCKS AND BOLTS.—C. E. Pierce, New York city.
104,196.—SHEET-METAL PIPE FORMING AND THREADING MACHINE.—M. K. Pierce, Calahan's Ranch, Cal.
104,197.—DEVICE FOR RAISING AND LOWERING GAS FIXTURES.—J. F. Pond, Cleveland, Ohio. Antedated June 1, 1870.
104,198.—VESSEL FOR PACKING BUTTER AND OTHER ARTICLES.—William Pratt, New York city.
104,199.—TURBINE WHEEL.—Matthias Rapp, Rapp's Mill, Va.
104,200.—HEELS FOR BOOTS AND SHOES. — Joseph Read, Philadelphia, Pa.
104,201.—CASTER FOR BILLIARD TABLES AND FURNITURE. — William Reagan, New York city.
104,202.—COMB.—J. C. Reed, New York city.
104,203.—INKING APPARATUS FOR PRINTING PRESSES.—I. L. G. Rice, Cambridge, Mass.
104,204.—APPARATUS FOR CURE OF SPERMATORRHOEA.—I. L. G. Rice, Cambridge, Mass. Antedated June 2, 1870.
104,205.—MOLD FOR GLASS LAMPS.—D. C. Ripley, Birmingham, Pa.
104,206.—TRY-SQUARE AND BEVEL.—I. J. Robinson, St. Johnsbury, Vt.
104,207.—CONSTRUCTION OF CANE SEAT CHAIR.—C. M. Rohr, Portland, Oregon.
104,208.—WHEEL FOR VEHICLES.—John D. Ross, Truckee, Cal.
104,209.—REFRIGERATOR.—Beneditt Sauter, Danbury, Conn.
104,210.—GATE.—E. B. Scattergood (assignor to W. H. Watts), St. Johns, Mich.
104,211.—BREECH-LOADING FIREARM.—Geo. W. Schofield, U. S. Army.
104,212.—GRATE AND FIRE POT FOR HEATING STOVE.—P. J. Schopp, Louisville, Ky.
104,213.—DRAIN TILE.—F. E. Scott, Centreville, Ind.
104,214.—ATTACHING SPONGE HOLDER TO TABLES, ETC.—C. S. See, New Brunswick, N. J.
104,215.—PILE DRIVER.—Thomas Shaw, Philadelphia, Pa.
104,216.—EYE GLASS HOLDER. — Gerard Sickles, Boston, Mass.
104,217.—ELECTRIC FUSE HEAD.—H. Julius Smith, Boston, Mass.
104,218.—ROOT CUTTER.—J. F. Smith and Harrison Underwood, Westmoreland, N. Y.
104,219.—METALLURGIC FURNACE FOR IRON AND STEEL.—J. Y. Smith, Pittsburgh, Pa.
104,220.—PROCESS FOR PURIFYING AND REDUCING MAGNETIC ORES OF IRON.—John Y. Smith, Pittsburgh, Pa. Antedated June 3, 1870.
104,221.—MAGNETIC MACHINE FOR CLEANING AND SEPARATING ORES OF IRON.—J. Y. Smith, Pittsburgh, Pa. Antedated June 3, 1870.
104,222.—ANIMAL SHEARING MACHINE.—R. T. Smith, J. K. Priest, and William Earl, Nashua, N. H.
104,223.—BREECH-LOADING FIREARM.—William Soper, Reading, England.
104,224.—VALVE GEAR OF STEAM ENGINE.—D. G. Starkey, New York city.
104,225.—HEATING STOVE. — John F. Still, West Farms, N. Y.
104,226.—CATARACT MECHANISM FOR STEAM ENGINES.—J. Storer, New York city. Antedated June 3, 1870.
104,227.—CLOTHES DRYER.—Leroy M. Streeter, Oshkosh, Wis.
104,228.—WINDOW GUARD.—Wm. K. Thomas (assignor to himself and W. E. Hill), Brooklyn, N. Y.
104,229.—TAG FOR SHOE STRING.—Jas. Twamley, New York city.
104,230.—SAW BUCK.—Peter Tyler, Ypsilanti, Mich.
104,231.—EMERY POLISHING WHEELS, ETC.—W. P. Van Kleeck, Charlestown, Mass.
104,232.—CARPET FABRIC.—William Wallace (assignor to himself and Charles McAllister), Philadelphia, Pa.
104,233.—HAY GATHERER.—Charles Waste, Galesburg, Ill.
104,234.—DIE FOR CUTTING SCREW THREADS ON BOLTS.—James E. Weaver, Temperanceville, Pa.
104,235.—DISH WASHER.—Glory Ann Wells, Luzerne, N. Y.
104,236.—TYPE DISTRIBUTING MACHINE.—Chas. S. Wescott, Elizabeth, N. J., and Alex. K. Rider, New York city. Antedated May 9, 1870.
104,237.—COMBINED IRON AND STEEL BAR.—Ellridge Wheeler, Hudson, Mass.
104,238.—MANUFACTURE OF RAILS FOR RAILROADS.—Ellridge Wheeler, Hudson, Mass.
104,239.—CARRIAGE SPRING GUARD.—O. H. Wheeler, Hamlin, Mich.
104,240.—HORSE POWER.—Seth Wheeler, Albany, N. Y.
104,241.—COLORING PHOTOGRAPHS. — Robert Winter, San Francisco, Cal.
104,242.—STOVE GRATE. — Andrew Winterburn, Albany, N. Y.
104,243.—CHAIR SEAT.—Benjamin F. Wright, Charlestown, Mass.
104,244.—BUNG.—Joseph F. Applegate, New Albany, Ind.
104,245.—METALLIC CONNECTIONS FOR MOSQUITO NET FRAME.—Uel W. Armstrong and Ira Keeney, of Evansville, Ind., assignors to U. W. Armstrong.
104,246.—STEAM RADIATOR.—A. C. Baker (assignor to himself and G. F. Laflin), Westfield, Mass.
104,247.—SEWING MACHINE.—Walker B. Bartram, Danbury, Conn.
104,248.—SHIFTING CARRIAGE OR BUGGY SEAT.—Sylvester W. Beach, South Bend, Ind.
104,249.—MACHINE FOR GRADUATING SQUARES, ETC.—C. S. Bement, Southington, Conn.
104,250.—CIGAR PUNCH.—S. J. Bestor (assignor to H. W. Conklin), Hartford, Conn.
104,251.—POTATO DIGGER.—Daniel Bibbee and Wm. Rand, Letart Falls, Ohio.
104,252.—SPRING HINGE.—James Bidwell (assignor to himself and James McMeehan), San Francisco, Cal.
104,253.—GAS MACHINE.—William W. Binny, Auburn, N. Y., assignor to S. N. Bierce, New York city.
104,254.—DUMPING CAR.—Theo. Bootsmann, Tompkinsville, N. Y.
104,255.—PORTABLE WRITING DESK.—Wm. Bothe, Williamsburgh, N. Y., assignor to Culbert & Co., New York city.
104,256.—PIANOFORTE.—William Bourne (assignor to himself and Nathaniel Cummings), Boston, Mass.
104,257.—MACHINE FOR SETTING BUTTON OR LACING HOOK.—Horace C. Bradford, Providence, R. I.
104,258.—STOVE GRATE.—Lewis Bridge (assignor to David Stuart and Richard Peterson), Philadelphia, Pa.
104,259.—PREPARATION OF COLORING MATTER FROM MADDER FOR DYEING.—Thomas Bristow (assignor to Amasa Sprague), Cranston, R. I.
104,260.—NEEDLE SETTER AND THREADER.—R. W. Brown, Providence, R. I.
104,261.—EGG CARRIER.—Abner H. Bryant, Chicago, Ill.
104,262.—GRINDING ATTACHMENT FOR CARDING MACHINE.—A. J. Burke (assignor to himself and J. B. Merrow), Mansfield, Conn.
104,263.—SAFE DEPOSIT BOX.—Wm. H. Butler (assignor to Valentine & Butler Safe and Lock Company), New York city.
104,264.—BOLT HOLDER.—S. R. Butterfield (assignor to himself and S. J. Taylor), Rome, N. Y.
104,265.—HIGH AND LOW WATER INDICATOR.—Wm. Butterfield (assignor to himself and Wm. H. Worden), Madison, Wis.
104,266.—WASHING AND COOKING BOILER.—Nathan T. Case and Emma J. Case, Des Moines, Iowa.
104,267.—CHURN.—Henry Caslow, York, assignor to Jacob G. Myers, Siddonstown, Pa.
104,268.—BRICK MACHINE.—J. L. Chapman (assignor to himself and J. B. Stuart), Philadelphia, Pa.
104,269.—COAL STOVE.—De Witt C. Clark and H. W. Cady, Sioux City, Iowa.
104,270.—EARTH CLOSET. — Lewis G. Clock, Manchester, N. H.
104,271.—GAS BURNER.—Theodore Clough, Dobb's Ferry, N. Y.
104,272.—STOVE COVER, DISH, AND KETTLE LIFTER.—Cyrus Cole, Havana, N. Y.
104,273.—COMBINED STOVE LID AND COVER.—Thomas J. Coulston, Royer's Ford, assignor to E. S. Shantz and Oliver B. Keely, Springville, Pa.
104,274.—HEATING STOVE.—Thomas J. Coulston, Royer's Ford, assignor to E. S. Shantz and O. B. Keely, Springville, Pa.
104,275.—REVERSIBLE CAP AND SPOUT FOR OIL CAN.—E. T. Covell, Brooklyn, N. Y. Antedated June 6, 1870.
104,276.—COMPOSITION FOR TANNING.—G. W. Crabtree and John G. Stoakes, Chocoville, Arkansas.
104,277.—SPRING FOR VEHICLES.—Benjamin Crandall, Jr., Williamsburgh, N. Y.
104,278.—MACHINE FOR MAKING NEEDLES.—C. O. Crosby, New Haven, Conn.
104,279.—LUBRICATOR.—Daniel Currie, St. Louis, Mo., assignor to himself, H. K. Hazlett, and Samuel L. Fisher.
104,280.—CORN PLANTER.—N. C. Davis (assignor to I. N. Hobill), Worthington, Ohio.
104,281.—MANUFACTURE OF PAPER.—Levi Dodge, Waterford, N. Y.
104,282.—MANUFACTURE OF PAPER.—Levi Dodge, Waterford, N. Y.
104,283.—MILLSTONE BALANCE AND COOLER.—William B. Dolsen, Waterloo, Iowa.
104,284.—CONVEYING LIQUID.—Thomas Donnelly, Pittsburgh, and J. H. Anchors and Allen Anchors, Bear Creek Station, Pa.
104,285.—COMPOUND FOR POLISHING AND CLEANING MARBLE.—Peter Doyle and F. P. Colton, Hartford, Conn.
104,286.—VENTILATING ATTACHMENT FOR STOVES.—W. M. Eames, Ashtabula, Ohio.
104,287.—GATE LATCH.—E. E. Earll, Brooklyn, and J. B. Hunter, New York city.
104,288.—CRIB AND CRADLE.—Wm. H. Earnest (assignor for one half his right to Jacob Fromer), Parkersburg, West Va.
104,289.—PUMP.—Edmund Edwards, Westminster, England. Patented in England, August 6, 1868.
104,290.—HARVESTER.—John H. Elward, Polo, Ill.
104,291.—LIME KILN.—Thomas Ennett, Rockford, Ill.
104,292.—DIE FOR FORGING EARS FOR CARRIAGE SPRING HEAD.—John Evans, New Haven, Conn.
104,293.—ANIMAL TRAP.—Edwin B. Everitt, West Meriden, Conn.
104,294.—HINGE.—G. F. Fischer and Alexander Whelan (assignors to themselves and Joseph Kelly), Washington, D. C.
104,295.—TRUSS FRAME BRIDGE.—John Foreman, Pottstown, Pa.
104,296.—EARTH CLOSET.—J. A. French (assignor to himself and R. P. Elmore), Milwaukee, Wis.
104,297.—BAG FILLER FOR FANNING MILL.—J. G. Gephart, Dowagiac, Mich.
104,298.—PLATE LIFTER.—Edwin Gibbs, Richland Centre, Wis.
104,299.—WINDOW.—Erastus W. Giddings, Johnstown, Pa.
104,300.—INKSTAND.—Franklin T. Grimes, Liberty, Mo.
104,301.—PNEUMATIC LIQUID ELEVATOR.—John P. Gruber, New York city.
104,302.—SEED SOWER.—Wm. D. Guseman, J. A. Davis, and H. D. McGeorge, Morgantown, West Va.
104,303.—CORN PLANTER.—Emery E. Hardy and Napoleon Dubrul, Joliet, Ill.
104,304.—CHURN.—Francis M. Harris, Winnamac, Ind.
104,305.—RAILWAY SWITCH.—N. F. Hawkins, Chicot county, Arkansas. Antedated June 3, 1870.
104,306.—RAILWAY CAR COUPLING.—Alexis Hebert, Malone, N. Y.
104,307.—MEDICATED STEAM BATH APPARATUS.—Louis Heine and Charles Scholfield, Philadelphia, Pa.
104,308.—REIN HOLDER.—Jacob Herkimer, San Francisco, Cal.
104,309.—METAL SLEIGH RUNNER.—Daniel Holdman, Waterloo, Iowa.
104,310.—BED BOTTOM.—Enoch Hopkins, Newaygo, Mich.
104,311.—MANUFACTURE OF BEVERAGES FOR MEDICINAL AND OTHER PURPOSES.—E. N. Horsford, Cambridge, Mass.
104,312.—MACHINE FOR MAKING PAPER TUBES.—Conrad Hotz, Zurich, Switzerland, assignor to Paul Corbet and Lessieux.
104,313.—HAY SHELF OR RACK FOR WAGONS.—J. A. Hughes, Tindall, Mo.
104,314.—SASH HOLDER.—Robert B. Hugunin, Cleveland, O.
104,315.—CLAMPING MACHINE.—J. H. Humes (assignor to himself, R. M. Thompson, and L. H. Griffin), East Saginaw, Mich.
104,316.—HINGE.—G. S. Hurford, Canton, Ohio, assignor to himself and Wm. H. Hart.
104,317.—RATCHET DRILL.—Simon Ingersoll, Brooklyn, N. Y., assignor to S. C. Ingersoll, Stamford, Conn.
104,318.—LANTERN.—John H. Irwin, New York city.
104,319.—EARTH CLOSET.—George B. Jewett, Salem, Mass.
104,320.—GATE LATCH.—Job Johnson and Simon Ingersoll, Brooklyn, N. Y., assignors to Job Johnson.
104,321.—DOOR SILL.—Joseph Johnston and E. O. Marlow, Brodhead, Wis.
104,322.—OILER FOR LOOSE PULLEYS.—Charles A. King, Springfield, Mass.
104,323.—FURNACE AND CONDENSER FOR REDUCING CINNABAR AND OTHER VOLATILE ORES.—R. F. Knox and Joseph Osborn, San Francisco, Cal.
104,324.—VIOLIN.—Thomas P. Knox, Boston, Mass.
104,325.—CONCRETE PAVEMENT.—Gabriel Leverich and A. H. Emery, New York city.
104,326.—STEAM AND GAS PIPE HOOK.—C. B. Long (assignor to himself and Jonathan Luther), Worcester, Mass.
104,327.—MANUFACTURE OF FERTILIZERS FROM FISH, ETC.—Orazio Lugo, Baltimore, Md.

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104,328.—LET-OFF MECHANISM FOR LOOM.—James Magee (assignor to himself and S. A. Applin), Usquepaugh, and E. C. Clark, Kingston, R. I.

104,329.—WARPING MACHINE.—Colin Mather and William Rossetter, Salford, England.

104,330.—BRICK MACHINE.—Henry Mauthe (assignor to Julien Larru, New York city.

104,331.—HARVESTER.—L. J. McCormick, Wm. R. Baker, and Lambert Erpelding (assignors to C. H. McCormick & Brother), Chicago, Ill.

104,332.—COAL CAR.—Thomas McCrory, Fayette City, Pa.

104,333.—DRYER.—Peter Mickel, Milford, N. Y.

104,334.—CULTIVATOR.—Samuel H. Mitchell, El Paso, Ill.

104,335.—AUGUR.—Christian Monson, Moscow, Wis.

104,336.—FIRE KINDLER.—A. S. Morse and E. A. Jefferies, Wayne, Ind.

BORING MACHINE.—William Morstatt, New York

TAN CUTTER.—John Murphy, Green Point, N. Y.
mselt and J. F. Tobin, New York city.

104,339.—BAGGAGE CHECK.—Geo. F. Newcomb, New Haven, Conn.

104,340.—EXTENSION-TABLE SLIDE.—Henry Olds, Syracuse, N. Y.

104,341.—PIANO.—C. F. Oliver, Lynn, assignor to Nathaniel Cummings, Boston, Mass.

104,342.—STRAW CUTTER.—Nelson O'Neil, Purchase Line, assignor to himself and Edward O'Neil, Jr., Mitchell's Landing, Pa.

104,343.—PURIFYING ALCOHOL AND SPIRITS.—C. C. Parsons, New York city.

104,344.—SASH FASTENER.—Howard Perkins (assignor to himself and T. E. Grover, Mansfield), and John B. Hartwell, Walpole, Mass.

104,345.—PRINTING-TELEGRAPH INSTRUMENTS.—William P. Phelphs, Brooklyn, N. Y., and W. J. Philips, Philadelphia, Pa.

104,346.—KNITTING MACHINE.—D. C. Philip, Philmont, and Clark Tompkins and Ira Tompkins (assignors to Clark Tompkins), Troy, N. Y.

104,347.—MALT DRYER.—William L. Philips, Normal, Ill.

104,348.—JOINT FOR CEMENT PIPES.—D. G. Phipps (assignor to himself, M. M. Camp, and E. I. Foote) New Haven, Conn.

104,349.—HAY-BINDER POLE FOR WAGON.—Daniel Potter, Peoria, Ill.

104,350.—TREADLE MOVEMENT.—Orlando B. Potter, New York city.

104,351.—EVAPORATOR AND STILL.—M. H. Powers, Pike County, Ind.

104,352.—WATER VESSEL FOR STEAM FIRE-PROOF SAFES. G. W. Putnam, Billerica, Mass.

104,353.—CLOD CRUSHER AND PULVERIZER.—C. T. Ramsey, Farmer Center, Ohio.

104,354.—BRICK MACHINE.—Seth Rigby, 3d, Newcastle, Pa.

104,355.—RAILWAY GATES.—J. B. Rittenhouse, and Joseph Collins, Locust Lane, Pa.

104,356.—COMPOUND TO INCREASE THE FRICTION BETWEEN BELTS AND PULLEYS.—Louis F. Robertson, New York city.

104,357.—FIRE-ALARM TELEGRAPH APPARATUS.—Edwin Rogers, Boston, Mass.

104,358.—SOFA BED.—J. J. Russ, Worcester, Mass.

104,359.—HINGE FOR BLINDS.—Dewitt C. Sage, Middletown, Conn.

104,360.—WALL AND FLOOR FOR BUILDINGS.—John J. Schillinger, New York city.

104,361.—BLACKING BRUSH AND CASE.—John Schwab, Bridgeport, Conn., assignor to himself and Phillip Roller, New Haven, Conn.

104,362.—HYDRAULIC AIR-COMPRESSING APPARATUS.—Wm. D. Seal (assignor to himself and Edmund Sayre), Washington, D. C.

104,363.—MEAT CUTTER.—Henry Seib, New York city.

104,364.—CUTTING APPARATUS FOR MOWING MACHINE.—H. F. Shaw, West Roxbury, assignor to James A. Woodbury, Boston Mass.

104,365.—HORSE HAY FORK.—Amos Shellenberger (assignor to himself and J. Z. Ligler), Versailles, Ohio.

104,366.—LAMP BURNER.—G. L. Smith (assignor to Bridgeport Brass Company), Bridgeport, Conn.

104,367.—CRANK MOTION FOR ENGINE.—John Smith and Godfrey Joithe, Newark, N. J.

104,368.—LOG-MEASURING SCALE.—Luther Smith (assignor to himself and James A. Pevey), Lowell, Mass.

104,369.—INTERFERING PAD FOR HORSES.—William Somerville, Buffalo, N. Y.

104,370.—LATCH FOR CUPBOARD.—W. E. Sparks (assignor to Sargent & Co.), New Haven, Conn.

104,371.—WATCH.—Henry Stauffer, Ponts Martel, Switzerland, assignor to Nordmann Brothers, New York city.

104,372.—LAMP.—Leonard Sterling and T. W. Willson, New York city,

104,373.—HAY RACK FOR WAGON.—J. W. Stevens and John P. Bacome, Westville, Ohio.

104,374.—PUMPING APPARATUS.—David Stoner, Canton, Ohio.

104,375.—RAILWAY TRACK CLEARER.—R. B. Taylor, Reading, Pa., assignor to himself, J. H. Boone, Jonathan M. Heller, and C. B. Bertolette.

104,376.—FIRE-PLACE HEATER.—John M. Thatcher, Bergen, N. J.

104,377.—CHECK-REIN ATTACHMENT.—Albert Thayer and W. A. Hastings, Thorndike, Mass.

104,378.—SEWING MACHINE COVER.—W. P. Uhlinger and Justus Doering, Philadelphia, Pa.

104,379.—GAME.—Nicholas J. Vander Weyde, New York city. Antedated June 3, 1870.

104,380.—MACHINE FOR MAKING ROOFING FELTING.—Edward Van Orden, New York city.

104,381.—MACHINE FOR MAKING NETTING.—Aloha Vivarttas, New York city, assignor to himself and John W. Keene, Newark, N. J.

104,382.—PAPER OR PAPER-AND-CLOTH NECKTIE.—Rudolph L. Walter, Washington, D. C. Antedated June 4, 1870.

104,383.—PROCESS FOR CLEANING AND POLISHING COFFEE. C. C. Warren and J. B. Baldy, Toledo, Ohio.

104,384.—GRIST MILL.—C. T. Weston, Sidney Broadbent, and Willard B. Culver, Scranton, Pa.

104,385.—IRONING TABLE AND BUREAU.—Margaret White, Saratoga Springs, N. Y.

104,386.—HARVESTER.—William N. Whiteley, Springfield, Ohio.

104,387.—BREECH-LOADING FIRE-ARM.—J. M. Whittemore, Augusta, Me.

104,388.—CAST IRON TURN-TABLE FOR RAILWAY.—A. J. Wight and W. L. Meeker, Newark, N. J.

104,389.—OIL CABINET.—M. H. Wiley, East Boston, Mass., assignor to himself, Thomas Miller, and J. H. B. Lang, Boston, Mass.

104,390.—TOOL FOR MAKING BOTTLES.—James Wilson (assignor to Elizabeth Matthews, John Matthews, Jr., and Geo. Matthews), New York city.

104,391.—CARD CABINET.—Arthur T. Woodward, New York city.

104,392.—MILK COOLER.—David F. Woodward, Jasper, N. Y.

104,393.—MUSICAL STAFF.—Horton Wright, Akron, Ohio, assignor to himself and O. D. Childs.

104,394.—LOCK FOR FIRE-ARMS.—Alfred Young, Philadelphia, Pa.

104,395.—SASH HOLDER.—John F. Zacharias, Leesburg, Va.

104,396.—COTTON SCRAPER.—James Lytch, Laurinburg, N. C.

104,397.—CORE-BAR FOR CASTING PIPE.—John Enright (assignor to himself, William Wall, and Thomas Enright), Louisville, Ky.

REISSUES.

4,025.—VEGETABLE AND FRUIT PEELER.—E. D. Averell and Joseph Malan, Brooklyn, N. Y.—Patent No. 100,583, dated March 8, 1870.

4,026.—OVEN.—Hosea Ball, New York city.—Patent No. 15,753, dated September 23, 185 ; reissue No. 3,606, dated October 12, 1869.

4,027.—STEAM GAGE COCK.—O. T. Earle, Norwalk, Conn., assignee of Albert Bisbee.—Patent No. 13,563, dated September 18, 1855; extended seven years.

4,028.—BEDSTEAD FASTENING.—J. L. Haven & Co., Cincinnati, Ohio, assignees of John Lemman.—Patent No. 58,437, dated October 2, 1866.

4,029.—TOOL FOR MANUFACTURING PAPER BAGS.—E. J. Howlett, Philadelphia, Pa., assignee of himself and Susan Kirk.—Patent No. 63,342, dated Feb. 26, 1867; reissue No 3,718, dated November 9, 1869.

4,030.—RECOVERING GOLD AND SILVER FROM WASTE SOLUTIONS.—Jehyleman Shaw, Bridgeport, Conn.—Patent No. 35,842, dated July 8, 1862; reissue No. 1,651, dated April 5, 1864; reissue No. 3,506 dated June 15, 1869.

4,031.—IMITATION HAIR FOR LADIES' HEAD DRESS.—L. F. Shaw, New York city.—Patent No. 95, 275, dated October 26, 1869.

4,032.—METALLIC CAN BOTTOM.—H. W. Shepard, Mannsville, N. Y., and Robert Seaman, New York city, assignees of H. W. Shepard.—Patent No. 98,526, dated January 4, 1870.

4,033.—FASTENING FOR NECK-TIE.—D. H. Tierney, Forrestville, Conn.—Patent No. 84,974, dated December 15, 1868.

4,034.—STATIONERY FURNITURE.—C. H. Wight, Baltimore, Md.—Patent No. 98,453, dated December 28, 1869.

4,035.—OIL CABINET.—Moses H. Wiley, Thomas Miller, and J. H. B. Lang, East Boston, Mass., assignees of M. H. Wiley.—Patent No. 101,070, dated March 22, 1870.

DESIGNS.

4,148.—LAMP BURNER.—Joseph Bell Alexander, Washington, D. C.

4,149.—SPOOL STAND.—R. G. Clemons, Nashua, N. H.

4,150.—CARRIAGE STEP.—J. W. Curtis, F. A. Briggs, and M. O. Cox, Coldwater, Mich.

4,151.—BOX FOR THE TOP OF BUREAUS.—Cheney Kilburn (assignor to Kilburn & Gates), Philadelphia, Pa.

4,152.—PRINTING TYPE.—Andrew Little, New York city.

4,153.—TRANSPARENT SHIELD.—Israel C. Mayo, Gloucester, Mass.

4,154.—TRADE MARK.—S. P. M. Tasker (assignor to Morris, Tasker & Co), Philadelphia, Pa.

4,155.—SPOON HANDLE.—Robert Wallace, Wallingford, Conn.

Answers to Correspondents.

CORRESPONDENTS who expect to receive answers to their letters must, in all cases, sign their names. We have a right to know those who seek information from us; besides, as sometimes happens, we may prefer to address correspondents by mail.

SPECIAL NOTE.—This column is destined for the general interest and instruction of our readers, not for gratuitous replies to questions of a purely business or personal nature. We will publish such inquiries, however when paid for as advertisemets at $1·00 a line, under the head of "Business and Personal."

All reference to back numbers should be by volume and page.

T. G., of Tenn.—To join two pieces of lead pipe, spread the end of one piece with a conical piece of wood, and scrape down the end of the other piece to a taper. Insert the tapered end into the enlarged end, and rub a little tallow on the parts to be joined. Hold under the joint two or three thicknesses of greased bed ticking, and cover the joint with a ball of melted lead, smoothing the surface with a plumbers' iron. This is easier described than done on the first trial, and you must not be surprised if the job is one that would make an old plumber grin.

J. E. M., of Colorado, states that he was born in Canada, came here before he was 21, has lived here 13 years, served in the Union army was honorably discharged, and has exercised the right of suffrage here, but has never been formally naturalized. Under these circumstances he asks whether he can take a patent out on the same terms as citizens of the United States; or must he pay $500 like inhabitants of Canada.—We reply that you can take patents here on the same terms as citizens. You are not an inhabitant of Canada.

D. L. P., of Miss.—To find the circumference of an ellipse add together the transverse and conjugate diameters, and multiply the half sum by 3·1416. The product will be the circumference. To find its area, multiply these diameters together, and multiply the product by the decimal ·7854. These rules are incorrect for ellipses in which one diameter is very long in proportion to the other, but they are sufficiently accurate for most practical purposes.

L. D. C., of Mich.—The true reason why the wheels on the trucks of cars and locomotives do not slip is the conical form of the tread of the wheels. The reply sent us is entirely erroneous. Our answer of course supposes proper relation of curves to the conical form of the tread of the wheels, which is not always uniform. Hence there is more or less slip in some cases.

J. K. C., of Mich.—The bronze used for statuary is said to be composed of copper, 91·4 parts; zinc, 5·5; lead, 1·7; tin, 1·4. In preparing this alloy the copper should be first melted. Powdered charcoal should be sprinkled over it to prevent oxidation, and a covered crucible should be used. When the copper is melted the other metals may be added.

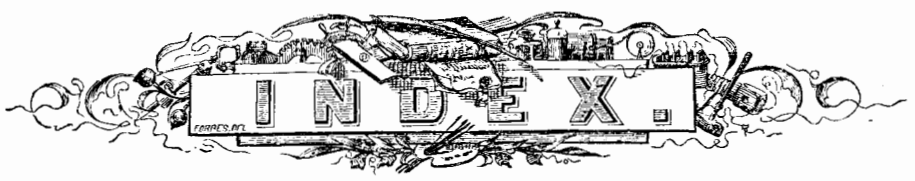
D. D. V., of R. I.—The distinction between vapor and steam made by Main, in his treatise on the marine steam engine is this: Vapor is only formed at the surface. Steam is formed from the body of the fluid. Steam is not formed until the liquid has arrived at a certain temperature. The formation of steam is a violent process, while that of vapor is a quiet process.

W. B. W., of Cal.—You are correct. The pressure upon a tight fitting slide valve is equal to the pressure per square inch in the steam chest multiplied into its area in inches. Whatever back pressure is obtained through the parts must be deducted in estimating the effective pressure from which friction arises.

A. B. J., of Me.—To prepare a solution of indigo or sulphindigotic acid, dissolve one part of pulverized indigo in seven parts of fuming oil of vitriol (Nordhausen Sulphuric Acid), and filter. For chemical laboratory use it is generally diluted with pure water until it assumes a pale transparent blue color.

T. L., of N. Y.—The velocity of sound through different kinds of wood varies very considerably. It also travels faster in the direction of the fiber than across it. The velocity of sound through pine lengthwise of the grain is 10,900 feet per second. Across the grain it is only 4,611 feet.

G. Y., of Pa., wants a better cement for rubber and rubber cloth than that sold by the dealers in rubber goods. We know of none He is mistaken in supposing that rubber goods are joined at the factories by a kind of solvent cement. No solvents are used in their manufacture



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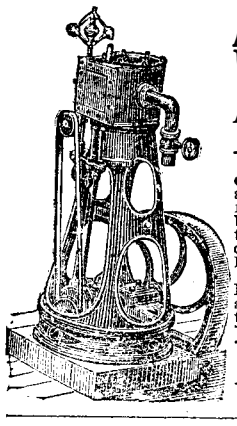

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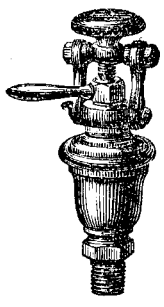

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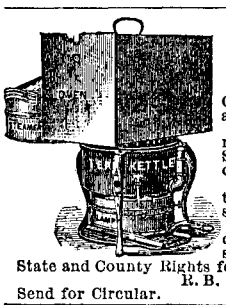

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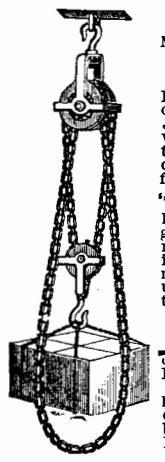

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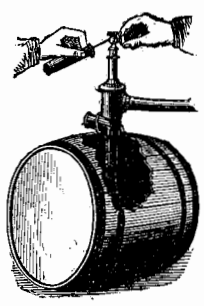

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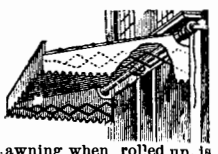

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